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The "Sandor" Diamond Occurrence, Michipicoten Greenstone Belt, Wawa, Ontario: A Preliminary Study

by

R.P. Sage

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The "Sandor" Diamond Occurrence, Michipicoten Greenstone Belt, Wawa, Ontario: A Preliminary Study

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ABSTRACT

The "Sandor" diamond occurrence represents the first Ontario discovery of diamond in a non-kimberlite host, and the first Canadian discovery of diamond in rocks of Archean age. The diamond occurs in dikes of fine-grained spessartite lamprophyre with meta-pyroxenite inclusions up to 1 m in maximum dimension in a fine-grained groundmass. The inclusions are commonly widely scattered throughout the lamprophyre dikes, weather in prominent relief and may be enclosed within a dark biotite-rich reaction rim several centimetres in width. Compositionally, the dikes are equivalent to a basalt or mildly alkalic basalt magma and classified as "spessartite". The dikes favourable to hosting diamond are concentrated in the northwest-central region of the Michipicoten greenstone belt and restricted to a synformal anticline centred in Lalibert Township near the Dickenson Lake (syenite) stock. The dikes are metamorphosed and deformed along with the supracrustal rocks. A possible relationship between the dikes and the syenite stock remains to be positively identified.

The dikes are narrow (5 m or less in width), of limited lateral extent and only approximately 10% have been found to contain diamond. Diamond is distributed erratically throughout the dikes and, while it has been established that the matrix of dikes contain diamond, it has not been conclusively established whether diamond is present within the inclusions. The rounded inclusions are composed of carbonate, actinolite and talc and compositionally are equivalent to pyroxenite.

The dikes do not contain minerals, or mineral compositions, typical of kimberlite and therefore are not likely the source of the kimberlite indicator minerals found in the region. Geophysical prospecting for the dikes has been ineffective, however, areas proximal to the dikes commonly display actinolite in alluvium and anomalous Cr and Ni in soils (Thomas 1998).

The potential for locating additional dikes hosting diamond is good.

Within the region of Wawa, small mafic to ultramafic intrusive bodies, such as found at Deep Lake, may present a topographic and geophysical expression comparable to that presented by kimberlite diatremes. These features can not be discounted as being kimberlite or related rock unless tested and sampled. These small mafic intrusive bodies complicate kimberlite exploration particularly when they occur with kimberlite indicator mineral dispersion trains. The Deep Lake mafic intrusion lies in proximity to the kimberlite indicator mineral dispersion train along Trout Creek outlined by Morris et al. (1994).

Sage, R.P. 2000. Precambrian geology. The "Sandor" diamond occurrence, Michipicoten greenstone belt, Wawa, Ontario: a preliminary study. Ontario Geological Survey, Open File Report 6016, 48 p.

Frontispiece. Multiple-twinned, clear diamond recovered from matrix sample collected from outcrop by the Ontario Geological Survey at the "Sandor" diamond occurrence.

INTRODUCTION

A lamprophyre dike was observed by veteran prospector Sandor Surmacz and geologist Marcelle Hauseux along highway 17 in Lalibert Township north of Wawa on June 22, 1993 (S. Surmacz, Prospector, personal communication, 1997)(Photo 1). Exploration was being conducted in the area under an Ontario Prospector Assistance Program (OPAP) grant. Kimberlite indicator minerals were not found at the site, but a representative sample was taken for geochemical analysis. This analysis failed to disclose a geochemistry favourable for the presence of diamond and work was suspended (S. Surmacz, Prospector, personal communication, 1997).

After examining a diamond-bearing dike with crustal xenoliths on the Thirsty (Akluilak) diamond project in the Northwest Territories with Comaplex Minerals Corporation in 1995, the Wawa dike was revisited (S. Surmacz, Prospector, personal communication, 1997). A description of this diamond-bearing dike in the Northwest Territories is given by MacRae et al. (1995) and Kaminsky et al. (1998).

A bulk sample collected from one dike exposed in a road cut along highway 17 was sent to the Saskatchewan Research Council's diamond-recovery laboratory and 6 gem diamonds were recovered (KWG Resources Inc., press release, June 6, 1996; S. Surmacz, Prospector, personal communication, 1997). A permit to prospect was obtained from the Algoma Central Railroad, ground was claimed and an option agreement was made with Spider Resources Inc. conditional on securing an agreement with the Algoma Central Railroad (S. Surmacz, Prospector, personal communication, 1997). The agreements with the Algoma Central Railroad were concluded in 1997 and prospecting in the region by Spider Resources Inc. began. Thomas et al. (1998) provide a brief history of the discovery, testing and geology of the "Sandor" diamond occurrence.

The "Sandor" diamond occurrence is the first discovery of a bedrock diamond source in the Michipicoten region since 1993 when veteran prospector "Mickey" Clement first reported alluvial diamond in the Michipicoten River. This discovery prompted the Ontario Geological Survey to conduct a kimberlite indicator mineral survey, which disclosed the presence of kimberlite indicator minerals in the alluvium (Morris et al. 1994). Prospecting for kimberlite and diamond in the region intensified and has since resulted in identifying an ultramafic dike with mantle xenoliths (Sage and Crabtree 1997) and kimberlite (Canabrava Diamond Corporation, press release, February 20, 1998). The "Sandor" diamond occurrence does not contain kimberlite indicator minerals so, while the presence of indicator minerals can be assumed to have stimulated much prospecting activity in the region, the indicator mineral trains did not play a direct role in the "Sandor" discovery.

Higgins (1986) examined a xenolith-bearing, diamond-absent lamprophyre dike exposed in a road cut on highway 17 in northern Lalibert Township and classified it as spessartite. A spessartite lamprophyre is defined as being composed of phenocrysts of green hornblende or clinopyroxene in a groundmass of sodic plagioclase with accessory olivine, biotite, apatite and opaque oxides (Johannsen 1970, p. 191; Bates and Jackson 1987, p. 632) and a comparable definition is given by Rock (1990) and LeMaitre (1989).

The following discussion is focussed on the field relations and classification of the dike rocks hosting diamond in order to stimulate exploration and additional study. Data are presented on two diamond-bearing occurrences selected by KWG Resources Inc. – Spider Resources Inc. (Photos 1 and 2) and a selection of diamond-absent dikes recommended by the companies. This study is considered to be preliminary.

LOCATION

The "Sandor" diamond discovery site is located at approximately lat. 48°12'42"N and long. 84°50'48"W in a roadcut on the east side of highway 17. The outcrop is located along highway 17 approximately 0.5 km north of the stream flowing into Wasp Lake and 2.0 km north of the south boundary of Lalibert Township (Figures 1 and 2; Photo 1). The site is approximately 25 km north of Wawa. Sample locations are provided on Figure 3. The dikes favourable to hosting diamond are centred in Lalibert Township and extend to Leclaire and Knicely townships and the northern one-third of Menzies Township (Figure 2; S. Surmacz, Prospector, personal communication, 1997). The dikes are restricted to the northwest portion of the Michipicoten greenstone belt, specifically west of the former Magpie Mine in Leclaire Township and east of the Dickenson Lake stock in Knicely Township. Lamprophyre dikes interpreted to be favourable for hosting diamond have not been observed in the external granitoid rocks enveloping the supracrustal rocks of the greenstone belt.

ACKNOWLEDGMENTS

Neil Novak, Exploration Manager, "Bram" Janse and Roger Thomas, Consulting Geologists, KWG Resources Inc. – Spider Resources Inc. have provided information and sample material for this study. Sandor Surmacz, Prospector, and Marcelle Hauseux, Geologist, have provided technical reports and the historical background to the diamond discovery. Roy Rupert, Consulting Geologist, provided samples on the Deep Lake mafic intrusion. Detailed discussions with Roger Thomas have been particularly helpful.

PHYSIOGRAPHY

The area of the diamond-bearing lamprophyre dikes displays a thickly bushed rolling topography. Outcrops are scattered, commonly relatively small in surface area and moss covered. The region has numerous lakes of all sizes and numerous swampy areas. Access is by poorly maintained logging roads, helicopter or canoe along the lake and stream systems. Traversing of the dense bush is slow and tedious. The lamprophyres do not form prominent outcrops and exposure is restricted to outcrops exposed in road construction and along the shorelines of lake and streams.

FIELD PROCEDURES

Occurrences of lamprophyre dikes favourable for hosting diamond were mapped by Sage (1993a, 1993b) and served as a basis for prospecting efforts in the region. For this study, sampling sites were those recommended by Neil Novak and Roger Thomas, KWG Resources Inc. – Spider Resources Inc. Inclusions were removed from the dikes by hammer and chisel and carbide saw. All xenolith material was removed from the matrix samples before analysis. A slab was removed from the centre of selected xenoliths, the matrix removed from the rims, and the complete sample submitted for chemical analysis.

PREVIOUS WORK

The lamprophyres of Lalibert, Leclaire and Knicely townships were mapped by Sage (1993a, 1993b). These studies were summarized by Sage (1994). Menzies Township has not been mapped. The only previous study on the lamprophyre dikes found to be favourable to hosting diamond is that of Higgins (1986). The work by Higgins (1986) was completed before it was recognized that some of the inclusion-bearing lamprophyre dikes contained diamond.

GEOLOGY

The lamprophyres hosting diamond were interpreted as Archean in age as the result of being affected by regional deformation and metamorphism (Sage 1994). Archean lamprophyres are common in greenstone belts of the Superior Province and broadly classified as shoshonitic by Wyman and Kerrich (1989). Fresh shoshonite is equivalent to a trachyandesite and a mineralogy consisting of olivine and augite phenocrysts in a groundmass of labradorite with alkali feldspar rims, olivine and augite with very minor leucite and glass (Bates and Jackson 1987, p. 611). The Wawa Archean lamprophyres do not contain fresh mineralogy and display a geochemistry that is weakly alkaline in character. Wyman and Kerrich (1989) interpret the shonshonitic lamprophyres to reflect late development in the formation of a greenstone belt and that they may display a spatial association with alkalic rocks. The Archean lamprophyres of the Michipicoten greenstone belt display these two regional characteristics. In the Michipicoten greenstone belt, only the Archean age lamprophyres have so far proven to be diamond bearing, but even in this group those containing diamond are not abundant.

The Michipicoten greenstone belt displays two ages of lamprophyre emplacement (Sage 1994). These two ages appear to be separated spatially as well as in time. Archean lamprophyres are commonly restricted to the region north of the Wawa–Hawk–Manitowik Lake fault. Proterozoic lamprophyres are abundant south of the Wawa–Hawk–Manitowik Lake fault and absent to rare north of the fault (Sage 1994). Sage (1994) relates this fault to the Kapuskasing Structural Zone. The Proterozoic lamprophyres are commonly olivine rich and extensively altered (Sage 1994). Mitchell and Janse (1982) have classed one of these dikes containing harzburgite xenoliths as a monchiquite and a possibly similar dike was classified as ultramafic by Sage and Crabtree (1997). On a regional basis, these dikes have been dated at 1.15 Ga (Queen et al. 1996). The present discussion excludes the Proterozoic lamprophyre dikes.

The lamprophyres favourable to hosting diamond are restricted in distribution to the supracrustal rocks in the northwestern portion of the Michipicoten greenstone belt. The dikes are centred on Lalibert Township, but extend into the eastern portion of Knicely Township and the western portion of Leclaire Township. The dikes are reported to occur in the northern one-third of Musquash Township (S. Surmacz, Prospector, personal communication, 1997). Most of the lamprophyre dikes that appear favourable to hosting diamond do not contain diamond.

Outcrop Appearance

Most lamprophyre dikes favourable for diamond are fine grained and contain isolated xenoliths of actinolite + talc + carbonate up to 1 m in size. The dikes weather black to greenish-black. The xenoliths are rounded, weather in positive relief and may display a dark, micaceous envelope (reaction rim) several centimetres in width that weathers low relative to matrix or xenolith (Photos 3 and 4). Several dikes consist solely of closely packed subrounded to subangular xenoliths that may be composite or multiple intrusive in nature (Photos 4, 5 and 6). One diamond-bearing dike, at Menzies No. 2 site, had closely packed angular xenoliths imparting a volcanic, tuffaceous appearance to the dike (Photo 2). The prominent weathering in relief of rounded xenoliths over the dark matrix makes the dikes favourable to hosting diamond easy to recognize in the field.

A number of the lamprophyres appear to cut the enclosing metavolcanic rocks at relatively shallow angles while others display sharply crosscutting relationships. The dikes favourable for the presence of diamond are cut by a later diatreme event in which angular blocks of lamprophyre dike are enclosed (Photo 7). The lamprophyre dikes that may host diamond are also cut by a later period of mica-rich lamprophyre diking. Most dikes are only a few metres in width; wider dikes have been observed in Leclaire Township on the east shore of Kapimchigama Lake. The xenoliths are altered to fine-grained actinolite with or without talc and some display zoning from a talc core to an actinolite rim (Photos 8 and 9). The actinolite crystals may project radially into the talc-rich core of the xenolith. At the "Sandor" diamond discovery, rounded xenoliths of very coarse-grained actinolite with crystals up to 4 to 6 cm in

length are present (Photo 10). At the "Sandor" diamond discovery, one angular to subangular crustal xenolith approximately 16 by 24 cm displayed folded gneissic banding (Photo 11). In thin section, the rock is a deformed, metamorphosed banded amphibolite (Sandor 2, Table 1) and its presence suggests that there was metamorphism and deformation of crustal rocks before intrusion of the lamprophyre dikes. The matrix of the lamprophyre dikes favourable to hosting diamond displays metamorphic textures and kimberlite indicator minerals are either absent or display compositions atypical of kimberlite. The lamprophyre dike forming the "Sandor" diamond occurrence is approximately 3 metres in width, steeply dipping and strikes approximately parallel to the regional schistosity at 120°. Due to bush cover, the dike cannot be traced southeast much farther than 25 m.

The tuffaceous appearing dike in Menzies Township (No. 2 site) had poorly developed contact relations with the enclosing metavolcanic rocks and appeared conformable or sill-like (Photo 2). This occurrence consists of a dike approximately 2 m wide with a south contact trending 250° dipping 50°N cutting volcanic breccia displaying a schistosity trending 325° dipping 40°E. The abundance of fragments prevented the collection of sufficiently clean matrix material on which chemical analysis could be completed.

Petrography

In thin section, the matrix displays a very fine- to fine-grained equigranular granoblastic texture to equigranular decussate texture (Photos 12 and 13). Biotite may display some clustering of the grains and the amphibole rarely displays a fibrous habit. The matrix consists of actinolitic amphibole, plagioclase feldspar and biotite mica. Microprobe analysis of the mineral phases found in these dikes from several sites is presented in Table 2. The plagioclase is albite (10.70 to 11.31% Na_2O) (Ab_{91-96}) and the mica a biotite. Pure albite is 11.8% Na_2O. The biotite in the matrix of the "Sandor" diamond occurrence displays a higher aluminum content than micas from diamond-free dikes (Figure 4). Brief thin section descriptions are in Table 1.

The dike on highway 17 just south of the Dubreuilville turnoff is slightly coarser grained than most other dikes examined. This larger grain size may represent an overprint of a contact metamorphic effect as the northern margin of the greenstone belt is nearby and the intrusive granitic rocks are younger than the rocks of the Michipicoten greenstone belt (Photo 14).

In all samples examined in thin section, the dike matrix displays a metamorphic texture due to a regional metamorphic event as metamorphic textures are present in all the dikes and their host rocks. There are no recognizable thermal or metasomatic effects on the enclosing metavolcanic rocks and a chilled contact margin is not present or is poorly developed in contrast to Proterozoic lamprophyres and diabase dikes of the region. The metamorphosed nature of the dike matrix and total alteration of the xenoliths indicates classification must be based on chemistry and normative mineralogy.

Petrology

Due to the metamorphosed nature of the matrix and altered nature of the xenoliths, selected samples were analyzed (Tables 3 and 4). These geochemical data were used to calculate a normative mineralogy for the matrix and xenoliths (Tables 5 and 6) using the Minpet 2.02 system. The geochemical data and normative calculations have been presented on Figures 5 and 6 along with similar geochemical data on kimberlite dikes from Kirkland Lake (Sage 1996a). The fields on the MgO/CaO versus SiO_2/Al_2O_3 diagram (Figure 5) are from Rock (1990, p. 87); the Cr versus Ni and Nb versus Zr are from Mitchell and Bergman (1991, p. 306, 318, respectively); and the Zr/Nb versus La/Yb, Sm versus La/Yb and La/Nd versus Sm/Nd are from Mitchell (1995, p. 276, 288, 291, respectively). These diagrams were selected as a means of comparing several rock groupings such as lamprophyre and kimberlite. Other geochemical plots exist which can be used for the same purpose. The geochemical plots portrayed emphasize relations with group 2 kimberlites (micaeous kimberlites, orangeites) and, in general, demonstrate a closer affinity of the

Wawa Archean lamprophyres to common mafic lamprophyres than to kimberlite. The Kirkland Lake kimberlites are group 1 kimberlites and not directly comparable to group 2. Group 2 kimberlites are not known to occur in Ontario. The Kirkland Lake kimberlite geochemistry provides a comparison between Ontario kimberlites and the "Sandor" diamond occurrence.

Chondrite-normalized rare earth element and extended trace element (spider plots) of the geochemical data indicate that the lamprophyre matrix and xenoliths have far lower rare earth element and high field strength element contents than the type 1 Kirkland Lake kimberlites (Figure 5). The slope of the curves for the "Sandor" diamond occurrence is much lower than those observed in the Kirkland Lake kimberlites. The slope of the chondrite-normalized curves for the Kirkland Lake kimberlites are similar to group 1 and group 2 kimberlites from southern Africa (Mitchell 1986, 1995).

The geochemistry of the dike matrix and xenoliths were plotted on an AFM diagram (Irvine and Baragar 1971) and a Jensen (1976) cation plot (Figure 6). These plots indicate that the matrix is dominantly high-magnesium basalt, and that the xenoliths cluster tightly in the ultramafic field. On a Meschede (1986) tectonomagmatic diagram, the dike matrix plots within the field of within-plate tholeiite and, on a Pearce and Cann (1973) diagram, the data plots astride the fields of calc-alkaline basalt and within-plate basalts. On a Wood (1980) diagram, the data plot within the field of destructive plate margin basalts. The general pattern observed in the tectonomagmatic plots is a setting of within plate or plate margin (Figure 6).

On a QAPF diagram (LeMaitre 1989, p. 23), the CIPW normative mineralogy for the dike matrix for most samples plot along the A-P join indicating the rock is in general silica saturated (Figure 6). The matrix to the "Sandor" diamond occurrence dike displays a mildly alkalic nature, plotting in the trachyte field, and the later mica-rich lamprophyres favourable to the presence of diamond are mildly silica oversaturated, plotting in the quartz latite field. While additional sampling is required to firmly establish that dikes containing diamond are mildly alkalic, this preliminary study suggests that alkalinity may be a distinctive feature of the diamond-bearing lamprophyres.

Normative mineralogy of the matrix and the xenoliths were plotted on Ol–Di–Hy and An–Di+Hy–Ol diagrams (LeMaitre 1989, p. 18, 21, respectively). These plots indicate that the matrix is equivalent to a gabbro and that the xenoliths are metapyroxenite (Figure 6).

Alkaline or mildly alkaline metavolcanic rocks have not been recognized in the Michipicoten greenstone belt, but the region contains two alkaline intrusions (Sage 1994). The silica-saturated Dickenson Lake stock (2677 ± 4.5 Ma) forms the western limit of distribution of lamprophyre dikes favourable to hosting diamond.

There could be a crude spatial relationship of the lamprophyre dikes to the eastern margin of this syenite stock. In the eastern part of the greenstone belt, the silica-undersaturated Herman Lake (nepheline–cancrinite–syenite) stock ($2671\ ^{+17}_{-10}$ Ma) is spatially separated from any lamprophyre diking known to host diamond (Sage 1994). There is a similarity in the rare earth element distribution pattern between the dike matrix and the Dickenson Lake stock (Figures 5 and 7), but not the Herman Lake stock (Sage 1994). While the shape and slope of the curves are similar, the Dickenson Lake stock displays slightly higher concentrations of the rare earth elements and high field-strength elements. The radiometric age and geochemistry suggest the possibility that the diamond-bearing lamprophyre diking and the emplacement of the Dickenson Lake stock may be closely related in space and time. The dating of the stock and lamprophyres needs further refinement before it can be stated the lamprophyres and syenite stock are coeval or closely related intrusions.

STRUCTURAL GEOLOGY

The lamprophyre dikes display structural fabrics conformable to regional-scale structural trends indicating they were deformed along with their enclosing Archean country rocks. Some dikes appear conformable and it is only upon detailed inspection that the crosscutting relations can be established. The diamond-bearing dikes appear to be restricted to a D_1 recumbent nappe in the west-central portion of the Michipicoten greenstone belt (Arias and Helmstaedt 1989; Sage 1994; Arias 1996). The nappe is imbricated by south-verging reverse faults (Arias 1996). The direction of nappe transport is from south to north (Arias and Helmstaedt 1989; Arias 1996) and it lies immediately north and adjacent to the Kapuskasing Structural Zone Uplift (Percival and West 1994). Sage (1993c) has suggested that this thrusting and shortening may be related to early tectonic events along the Kapuskasing Structural Zone.

The western limit of the nappe is likely the Dickenson Lake fault that passes along the west side of the Dickenson Lake stock. While lamprophyre dikes favourable to hosting diamond and ones that cut the diamond-bearing lamprophyres are common east of the Dickenson Lake stock, they are absent west of the stock (Sage 1993a, 1994). The nappe does not likely extend east beyond the Marsdan fault (Sage 1994), but lamprophyres interpreted to be favourable to hosting diamond do not extend east of the former Magpie iron mine in Leclair Township. The Magpie iron mine ceased production when a large intrusive body referred to as a "Mica Dyke" was encountered in the underground workings of the mine (Sage 1993b). This coarse-grained mica-rich material appears similar to the mica dikes that cut the lamprophyres favourable to hosting diamond.

The lamprophyre dikes exposed in roadcuts along highway 17 have a general easterly trend and steep dips. Those exposed near and east of Cruise Lake have a north-northwest trend and a dip from 45° to 90°W. An occasional dike will have a northeast strike and steep dip. On the existing very limited database, a dominant trend has not been established.

GEOCHRONOLOGY

The lamprophyre dikes were interpreted to be Archean in age since they display structural fabrics conformable to regional-scale structural trends (Sage 1993a, 1993b). This field observation indicates that they were deformed along with the enclosing Archean supracrustal rocks. When diamond was recovered from the inclusion-bearing lamprophyres, a limited U-Pb geochronology program was undertaken on suspected Proterozoic rocks. The emphasis on Proterozoic rocks was based on the fact that the nearby Proterozoic "Nicholson" ultramafic dike contained mantle xenoliths and indicator minerals (Sage and Crabtree 1997) and occurrences of Archean rocks containing diamond are not known in Canada.

Table 7 is a compilation of some selected U-Pb ages on Proterozoic rocks of the region along with the date on the "Sandor" diamond occurrence. Sage (1994) provides a compilation of U-Pb age determinations on the Michipicoten greenstone belt and associated rocks.

L.M. Heaman (University of Alberta, unpublished data, 1998) recovered abundant sphene and rutile from the sample of the dike matrix collected from the "Sandor" diamond occurrence. The abundance of these minerals in the sample suggests that these minerals are not xenocrystic (L.M. Heaman, University of Alberta, unpublished data, 1998). The sphene occurs as an overgrowth on the rutile and the relationship is interpreted by Heaman (University of Alberta, unpublished data, 1998) to represent primary magmatic rutile with metamorphic and/or metasomatic sphene overgrowths. The 2703 ± 42 Ma age was obtained on sphene and interpreted to be a minimum age of intrusion. The rutile provided a younger Archean age, but much lower uranium content in the rutile and, thus, significantly lower closure temperature to Pb diffusion, makes the age less reliable (L.M. Heaman, University of Alberta, unpublished data, 1998).

Table 7. U-Pb isotopic ages on Proterozoic rocks of the region and the "Sandor" diamond occurrence.

Rock Type	U-Pb Age (Ma)	Discordancy	Reference
Wawa diabase	1142 ± 3	3.2%	1
Firesand River carbonatite	1078.7 ± 2.4	5.1%	1
"Sandor" diamond occurrence	**2703 ± 42**	**7.3%**	**1**
"Nicholson" ultramafic dike	1100 ± 40 (Rb-Sr)		2
Port Coldwell alkalic complex	1108 ± 1		3
Marathon lamprophyre dikes	1145 +15 / –10		4
Slate Island lamprophyre dike	1141 ± 9		4
Wawa lamprophyre dike	1143 ± 12		4

Notes: 1) L.M. Heaman, University of Alberta, unpublished data, 1998; 2) Sage and Crabtree 1997; 3) Heaman and Machado 1992; 4) Queen et al. 1996

Dating has confirmed the Archean age of the "Sandor" lamprophyre dike (Sage 1993a, 1993b). The Michicpicoten greenstone belt is composed of three mafic to felsic volcanic cycles and associated sediments. Geochronological studies (Sage 1994) indicate that the "Sandor" diamond occurrence dike is just slightly older than the Cycle 3 rhyolite, the youngest of 3 volcanic cycles in the Michipicoten greenstone belt. Dating of the cycles was conducted on the felsic volcanic portion of each cycle. Therefore, the age suggests that the lamprophyre dike of the "Sandor" diamond occurrence could have been emplaced late in the development of the mafic portion of the Cycle 3 volcanic rocks just before the onset of felsic volcanism. This possibility would negate a connection between the dikes and the alkalic Dickenson Lake stock which postdates (2671^{+17}_{-10} Ma, Sage 1994) the formation of the Michipicoten greenstone belt supracrustal rocks. The apparent spatial relationship to the Dickenson Lake stock would therefore be fortuitous.

INDICATOR MINERALS

Indicator minerals characteristic of kimberlite, the dominant host rock for diamond, are absent from these diamond-bearing lamprophyres. Two almandine garnets, commonly representing a crustal source, were recovered from the discovery outcrop, but no chrome pyrope garnets or chrome diopsides (Overburden Drilling Management Ltd. 1997). Chromite was recovered from the discovery outcrop as well as from a second diamond-bearing dike located in northeastern Menzies Township (Overburden Drilling Management Ltd. 1998). This chromite is low magnesium (less than 2.0%), high chrome (some grains over 60%) and high zinc (2.0 to 4.0% Zn) (Tables 8 and 9). Chromite compositions plotted on Cr_2O_3 versus MgO plots are atypical of kimberlite chromite (Figure 8). The high Zn content is characteristic of ultramafic lamprophyres rather than kimberlite (Griffin et al. 1997). While the chromite chemistry is not comparable with chromite from kimberlite, the low-magnesium, high-zinc characteristic is quite distinctive, suggesting that it could be used to outline down-ice dispersion patterns to assist in locating unexposed dikes.

Ilmenite is less common than chromite and geochemically plots as oxidized on Haggerty (1975) parabolic curves and Haggerty and Tompkins (1984) hematite–geikielite–ilmenite triangular diagrams (Tables 10 and 11; Figure 8). In the discovery dike, all ilmenites are oxidized and plot outside the field of kimberlite ilmenite compositions (Haggerty and Tompkins 1984; Figure 8); however in the Menzies Township site, two ilmenite populations are indicated. One population plots within the field of kimberlite ilmenite as outlined by Haggerty and Tompkins (1984) (Figure 8). The highly variable ilmenite compositions and relatively low volume of material make this mineral less suitable to define down-ice dispersion patterns.

Chromite and ilmenite are present only in the diamond-bearing lamprophyre dikes. The presence of these minerals suggests a given dike may be a favourable candidate to host diamond. It is unlikely that these dikes are the source for the kimberlite indicator minerals identified in the regional alluvium by Morris et al. (1994).

NOMENCLATURE

Due to metamorphism and alteration of both the dikes and the xenoliths, normative mineralogy has been used for classification of the dikes. The AFM and Jensen (1976) plots in Figure 6 indicate that the matrix is a high-iron tholeiitic to high-magnesium basalt in composition and that the xenolith population plots in the ultramafic komatiite field on a Jensen (1976) plot. Normative mineralogy shown on the QAPF diagram (LeMaitre 1989) indicate that the composition of most dikes fall along the A-P join and that the "Sandor" diamond occurrence has a mild alkalic signature (Figure 6). On a Hy–Di–Ol diagram (LeMaitre 1989; Figure 6) the normative mineralogy of the matrix is a websterite, olivine-websterite or olivine clinopyroxenite equivalent. Using a Di + Hy–Ol–An diagram, a composition approximating gabbro to gabbro-norite to norite-olivine gabbro is indicated (LeMaitre 1989; Figure 6). The normative mineralogy of the xenoliths on the above diagrams (Figure 6) indicates that they are compositionally equivalent to pyroxenite.

Higgins (1986) applied the name "spessartite" to these lamprophyre dikes and this appears to be a reasonable classification. Geochemistry and normative mineralogy support the spessartite classification and the diamond-bearing dikes may display a mildly alkalic character. The Archean diamond-bearing spessartite dikes of the Wawa region display a spatial association with alkalic intrusives and represent a late intrusive event into the greenstone belt. Wyman and Kerrich (1989) have described this relationship for Archean lamprophyres as a regional characteristic. Collectively, they referred to the lamprophyres as "shoshonitic".

EXPLORATION TESTING

Sandor Surmacz, Prospector, and Marcelle Hauseux, Geologist, sampled the discovery site in 1995. An 18.1 kg sample was sent to the Saskatchewan Research Council for processing and 1 macrodiamond (greater than 0.5 mm) and 5 microdiamonds (less than 0.5 mm) were recovered (Hauseux 1996; Spider Resources Inc., press release, June 25, 1996). The diamonds were described as clear, inclusion free, gem quality with some twinning. One diamond was cubic in form. Sampling by Spider Resources Inc. recovered 8 macrodiamonds and 56 microdiamonds from a 67.6 kg sample in 1996 (Spider Resources Inc. – KWG Resources Inc., press release, September 23, 1996). Spider Resources Inc. – KWG Resources Inc. (press release, August 19, 1997) report that they recovered an additional 2 macrodiamonds and 19 microdiamonds from a 169.9 kg sample at the "Sandor" diamond occurrence. Upon confirming the presence of diamond, the occurrence was optioned from Saminex by Spider Resources Inc. and mineral rights were obtained from the Algoma Central Railroad on 222 1 km^2 grid claims (Thomas 1998). These claims were scattered throughout Lalibert, Menzies, Knicely, Macaskill, Musquash and Leclaire townships. During 1996 and 1997, over 80 lamprophyre dikes were tested for diamond, resulting in the identification of 8 diamond-bearing dikes (Thomas 1998, p. 17). These results suggest that approximately 10% of the dikes appearing favourable for hosting diamond actually contain diamond.

The diamond-bearing dikes were identified in roadcuts along highway 17 and westward to near the east contact of the Dickenson Lake stock. The company completed soil sampling, stripping and some trenching. The company analyzed for Zn, Mo, As, Cu, Pb, V, Y, Au, Ti, Ca, Cs, Co, Fe, Cr, Ni and Mg in their soil sampling program and established actinolite as the best indicator mineral to indicate possible diamond-bearing dikes. In soil sampling, the potentially diamondiferous dikes were characterized by anomalous Cr and Ni and Co and Mg had some value as a prospecting guide.

In 1997, Spider Resources Inc. – KWG Resources Inc. (press release, August 19, 1997) reported recovery of 15 macrodiamonds and 80 microdiamonds from 164.7 kg of material from the Menzies No. 2 site in Menzies Township. The largest diamond was a white, transparent fragment measuring 0.82 by 0.76 by 0.65 mm (Spider Resources Inc. – KWG Resources Inc., press release, August 19, 1997). The companies also reported that a sample taken in 1996 yielded 2 macrodiamonds and 6 microdiamonds from 28.3 kg of sample material from the same site. This second occurrence is xenolith rich and has a tuffaceous appearance. Sampling of the Menzies No. 2 site by the Ontario Geological Survey recovered zinc-bearing chromite, but no diamond, from a 13.68 kg sample (Overburden Drilling Management Ltd. 1998). Overburden Drilling Management Ltd. (1998) report recovering the rare earth carbonate ancylite [$SrCe(CO_3)_2(OH)\cdot H_2O$] from the heavy mineral fraction suggesting the dike is at least mildly alkalic in nature.

In 1997, Overburden Drilling Management Ltd. processed for the Ontario Geological Survey 20.43 kg of sample material from the "Sandor" Diamond discovery and recovered 2 macrodiamonds. The diamonds are octahedral twins with high clarity (Overburden Drilling Management Ltd. 1997). The largest stone was a multiple twin similar to a star twin (Bruton 1978, *see* figures 17.19, 17.20) measuring 1.3 by 1.5 by 1.0 mm (Photo 15, Frontispiece). The second stone was a fragment measuring 400 by 500 by 600 μm. The Ontario Geological Survey sample tested only the matrix; all xenolith fragments were removed before processing. In summary, 11 macrodiamonds and 82 microdiamonds have been recovered from approximately 276 kg of material from the "Sandor" diamond occurrence. At the Menzies No. 2 site, 17 macrodiamonds and 86 microdiamonds have been recovered from 193 kg of material. Table 12 provides a summary of all diamond occurrences identified by Spider Resources Inc. (Thomas 1998).

The report by Thomas (1998) is voluminous and therefore the following summary of the report is offered.

1. The favourable dikes vary from 0.1 to 5.0 m in width. The only exception is the north-trending dike at Kapimchigama Lake which is up to 100 m wide.
2. The dikes weather recessively and can be traced only short distances.
3. Actinolite in the soils is a good indicator mineral for the presence of favourable dikes.
4. Anomalous Cr, Ni and sometimes Co in soils are good geochemical indicators.
5. The dikes cannot be located using magnetic or VLF-EM methods.
6. Most dike contacts are sharp.
7. Rare contact metamorphism up to 0.1 m wide along dike margins has been observed.
8. Angular wall rock xenoliths are commonly present and are concentrated along dike margins.
9. When present, diamond is not evenly distributed throughout the dikes. There is no correlation between the volume of actinolite xenoliths and diamond content.
10. There is no physical appearance or geochemical difference between the diamond-bearing and diamond-absent dikes.
    Note: Results of this study suggest that the diamond-bearing dikes may be slightly alkalic in nature and that the heavy mineral content, that is, zinc-rich chromite and some ilmenite, may distinguish diamond-bearing dikes from their barren equivalents.
11. There is no preferred orientation for the diamondiferous dikes (Figure 9).
12. Characteristic kimberlite indicator minerals were not found in the dikes or nearby alluvium.
13. There is more than one period of dike emplacement and a diatreme event pre- and postdates the diking event.
    Note: The author observed only one diatreme event which postdated dike emplacement.
14. The barren dikes in the Kapimchigama Lake and Clearview Lake areas, Lalibert and Leclaire townships do not have the actinolite and soil geochemical halos of the dikes located to the west even though they appear essentially identical.
15. Glacial transport is minimal and samples reflect in situ bedrock variations.

CONCLUSIONS

The Archean diamond-bearing lamprophyres of the Wawa area are spessartites that have incorporated large fragments of pyroxenite. Most dikes do not contain diamond. Prospecting for the favourable dikes is best guided by identifying actinolite, zinc-rich chromite and geochemical anomalies of chromium and nickel in the soils.

RECOMMENDATIONS FOR FUTURE STUDY

Additional testing and analysis of the diamond-bearing lamprophyres is needed to support and modify the preliminary interpretations presented here. The database on the heavy mineral characteristics of diamond-bearing lamprophyres needs to be expanded. The chromite and ilmenite geochemistry of the diamondiferous dikes appears unique and may offer some potential as a prospecting tool; both in dike selection and as disseminated grains in alluvium in down-ice dispersion trails. The mildly alkalic nature of the diamond-bearing dikes requires more investigation to determine if this is a universal characteristic of the Wawa diamond-bearing lamprophyre dikes.

The absence of actinolite dispersion and soil geochemical anomalies in the region of Kapimchigama and Clearview lakes suggests dikes in this region differ from the diamond-bearing dikes farther west. Since these dikes appear in the field similar to dikes favourable to hosting diamond, additional study is recommended to identify these differences.

RECOMMENDATIONS TO THE PROSPECTOR

The diamond-bearing lamprophyre dikes of the Wawa area represent relatively small exploration targets. The area is thickly mantled with bush and it is highly probable that many undiscovered diamond-bearing dikes remain to be found. Exploration will be difficult due to the lack of minerals of the kimberlite indicator mineral suite. The presence of low-magnesium, high-zinc chromite in the diamond-bearing dikes may be a good indicator mineral to define down-ice dispersion patterns in alluvium from unexposed dikes. Being restricted to diamond-bearing dikes, zinc-rich chromite makes it a particularly good mineral for tracing purposes. Since both dikes and xenoliths contain actinolite, this mineral may serve as a tracer mineral; however, this mineral will not discriminate between diamond-bearing and diamond-absent dikes.

The work by Spider Resources Inc. indicates that the presence of actinolite and anomalous chromium and nickel in the soils are the most promising methods of locating dikes favourable to hosting diamond (Thomas 1998).

Deep Lake

INTRODUCTION

In general, a circular form characterizes kimberlites and they generally weather low. Kimberlites yield a circular magnetic signature, that is either higher or lower than most country rock types. The circular form and magnetic signature is similar to many mafic to ultramafic intrusions within greenstone belts. Therefore, in this section of the report, a description of the Deep Lake anomaly is offered because it is characterized by a circular magnetic high and a recessive weathering rock type. Results of this work bear upon the search for kimberlite in the Wawa area.

The Deep Lake magnetic anomaly occurs within the Trout Creek drainage system from which kimberlite indicator minerals have been recovered (Morris et. al. 1994). The anomaly is circular to elliptical (Figure 10) and centred on an unusually deep lake for the region suggesting it lies above an easily eroded rock type that would be consistent with the presence of a kimberlite pipe. The field observations and geophysical data suggested a highly favourable target for drill testing. Exploration drilling intersected a non-kimberlite ultramafic to mafic intrusion and there are likely more small plug-like intrusions with these characteristics in the region. For those conducting exploration programs for diamond in the region, data on this mafic body is presented and compared with true kimberlite and the "Sandor" diamond occurrence (Figures 5 and 6).

LOCATION

Deep Lake is located in central McMurray Township at approximately lat. 47°58'07"N and long. 84°43'10"W. This is approximately 4.1 km southeast of the town of Wawa. Deep Lake is accessible by an unmaintained mine access road to the former Deep Lake gold mine.

ACKNOWLEDGMENT

Mr. Roy Rupert, Consulting Geologist, Citadel Gold Mines Inc. provided 3 sections of diamond drill for study.

PHYSIOGRAPHY

Deep Lake is an elongated, oval-shaped lake 600 m long (north to south) by 275 m wide. The lake is centred directly above an unexposed mafic to ultramafic intrusion. One vertical drill hole (DL 96-1) in the centre of the lake did not encounter bedrock until a depth of 52.4 m was reached (Figure 9).

The region around Deep Lake is characterized by numerous small, moss-covered outcrops. The topography is hilly with intervening areas of marshy ground.

PREVIOUS WORK

Prior to the diamond drilling by Citadel Gold Mines Inc., the mafic to ultramafic intrusion had not been recognized. McMurray Township and the surrounding area were mapped by Sage (1993c, 1994).

GEOLOGY

Field relations of Archean mafic to ultramafic intrusions within the Michipicoten greenstone belt suggest that there may be as many as four different ages of emplacement (Sage 1994). The two latest emplacements are crosscutting mafic dike-like bodies and younger small plug-like mafic to ultramafic intrusions usually centred above small lakes.

The Deep Lake intrusion is enveloped in the Jubilee tuffs on the east flank of the Jubilee stock. The Jubilee stock has been dated at 2745 ± 3.0 Ma, and a flow-banded intermediate to felsic flow incised into the intermediate composition Jubilee tuffs on the east flank of the stock has been dated at 2746 ± 11.0 Ma (Sage 1994). The Jubilee stock has been interpreted (Sage 1994) to be the subvolcanic equivalent to cycle 2 volcanism within the Michipicoten greenstone belt.

Most Archean mafic to ultramafic intrusions within the region are elongated and dike-like, however, some are distinctly plug shaped (Sage 1993c, 1994). The Sunrise Lake mafic to ultramafic intrusion in nearby Esquega Township is elliptical to dike-like in outline and centred on Sunrise Lake (Sage 1993c). While this body is somewhat larger than most kimberlite pipes, its circular, positive magnetic expression centred over a lake could provide incentive to a diamond prospector to investigate the area. A few mafic to ultramafic outcrops along the shoreline of Sunrise Lake provide a clue as to the cause of the magnetic anomaly, an outcrop feature absent at Deep Lake. Small, positive, circular to elliptical magnetic anomalies are centred on Lena, Mildred and Bauldry lakes in adjoining Chabanel Township. The cause of those anomalies can be determined by a few outcroppings of peridotite–pyroxenite along the shorelines of the lakes (Sage 1993c, 1994). A small, circular, positive magnetic anomaly at the southern end of Goetz Lake, Chabanel Township, known as Wagner's Anomaly 14b, is likely due to another small peridotite–pyroxenite plug (Sage 1993c).

The Deep Lake mafic to ultramafic intrusion is extensively serpentinized as is the Sunrise Lake intrusion (Sage 1993c). The small peridotite–pyroxenite plugs in Chabanel Township appear much less altered.

Sage (1994) interprets the Sunrise Lake mafic to ultramafic intrusion as being much older than the small peridotite–pyroxenite intrusions in Chabanel Township that appear related to post-regional deformation fault intersections. Sage (1994) interprets the small peridotite–pyroxenite bodies as Archean, but much later in emplacement in the history of development of the Michipicoten greenstone belt. For the diamond prospector, the small size of these intrusive plugs, circular to oval-shaped positive magnetic expression, centering on small lakes, all suggest an easily erodeable magnetic rock type that can characterize kimberlite intrusions. All these characteristics are features to attract the attention of diamond prospectors, particularly if these features are observed to occur in proximity to a kimberlite indicator mineral dispersion trail and cannot be explained in outcrop.

PETROGRAPHY

Three short lengths of uniformly textured core were investigated in thin section (Table 1) and submitted for complete rock analysis (Table 13). The rocks were extensively serpentinized, which destroyed primary textures and mineralogy. Thin section examination suggested that the rock was an altered peridotite to pyroxenite. The geochemistry was used to calculate CIPW normative mineralogy, which indicated that the rock is a pyroxenite (Table 14). The Deep Lake geochemical data were plotted on Figures 5 and 6 to be compared with kimberlite and the "Sandor" diamond occurrence. The geochemistry is characteristic of mafic to ultramafic rocks.

EXPLORATION HISTORY

Prior to the work of Citadel Gold Mines Inc., the presence of a mafic to ultramafic intrusion beneath Deep Lake was not known. The company attempted one vertical diamond drill hole (DL 96-1) in Deep Lake, that was abandoned at 58.5 m after penetrating only 6.1 m of mafic to ultramafic rock (Citadel Gold Mines Inc., private records). A second diamond drill hole from the west shore of Deep Lake was completed to a depth of 236.2 m (Figure 10). The hole was drilled at an azimuth of 115° and a dip of −56° and penetrated approximately 166.4 m of mafic to ultramafic rock. The true width is approximately 85 m (Citadel Gold Mines Inc., private records).

CONCLUSIONS

Small mafic to ultramafic intrusions near Wawa can provide topographic and geophysical signatures that cannot be distinguished from kimberlite intrusions without drill testing. The problem can be further compounded if these small mafic to ultramafic intrusions occur within kimberlite indicator mineral dispersion trains.

RECOMMENDATIONS TO THE PROSPECTOR

The testing of promising targets like the Deep Lake anomaly cannot be avoided if kimberlite is to be located in the region. It is likely that many more promising targets will be tested and proven not to be kimberlite as exploration of the region continues. The prospector should closely examine any target tested for diamond, since the one established diamond host rock in the region is not kimberlite and does not contain kimberlite indicator minerals.

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Figure 1. Index map showing the location of Wawa with respect to established areas of kimberlite occurrences (*modified from* Sage 1996b).

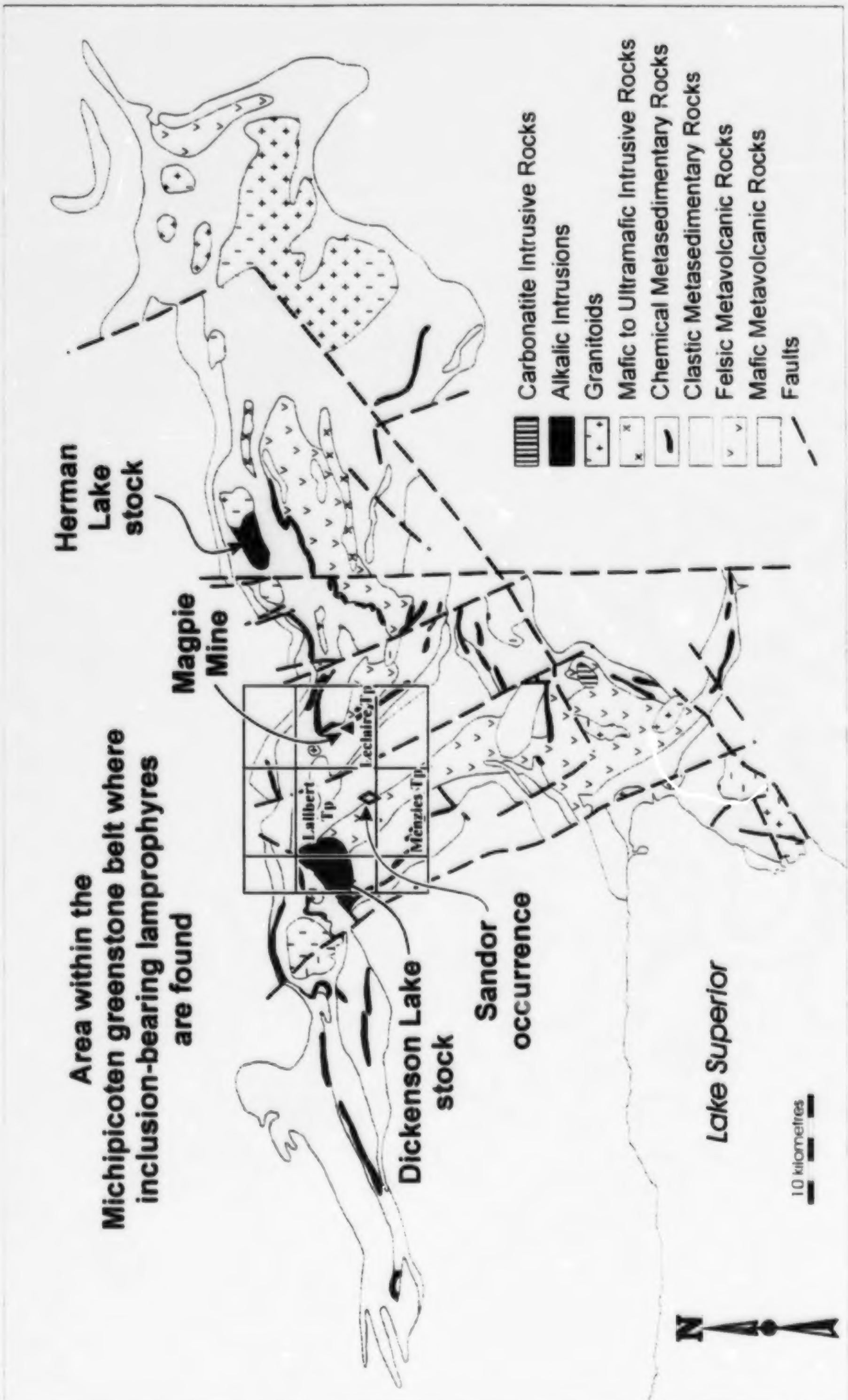

Figure 2. Sketch map of the Michipicoten greenstone belt showing where inclusion-bearing, possibly diamond-bearing lamprophyre dikes are found (*modified from* Sage 1994).

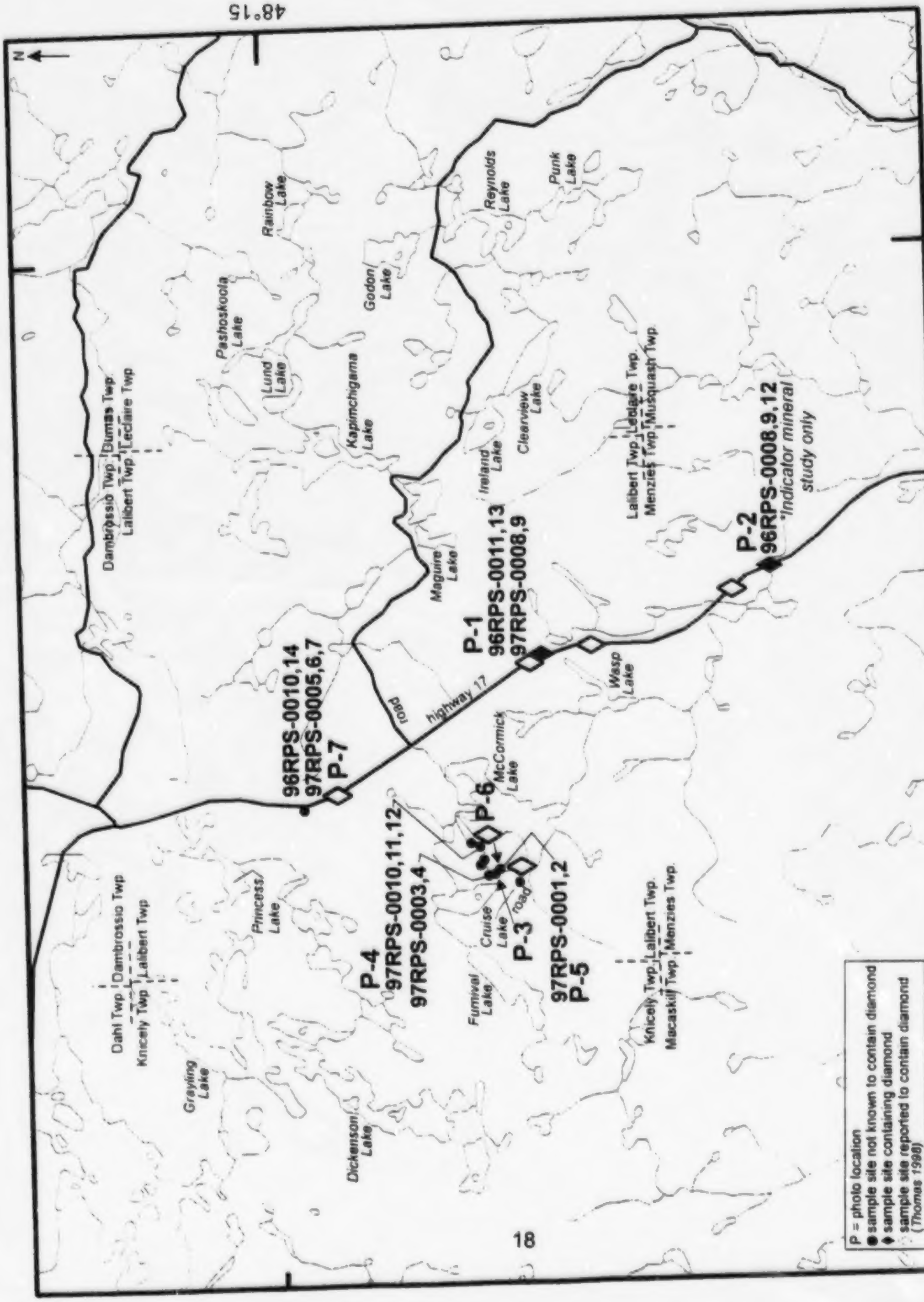

Figure 3. Sketch map showing location of samples for study of inclusion-bearing Archean lamprophyres which may or may not contain diamond.

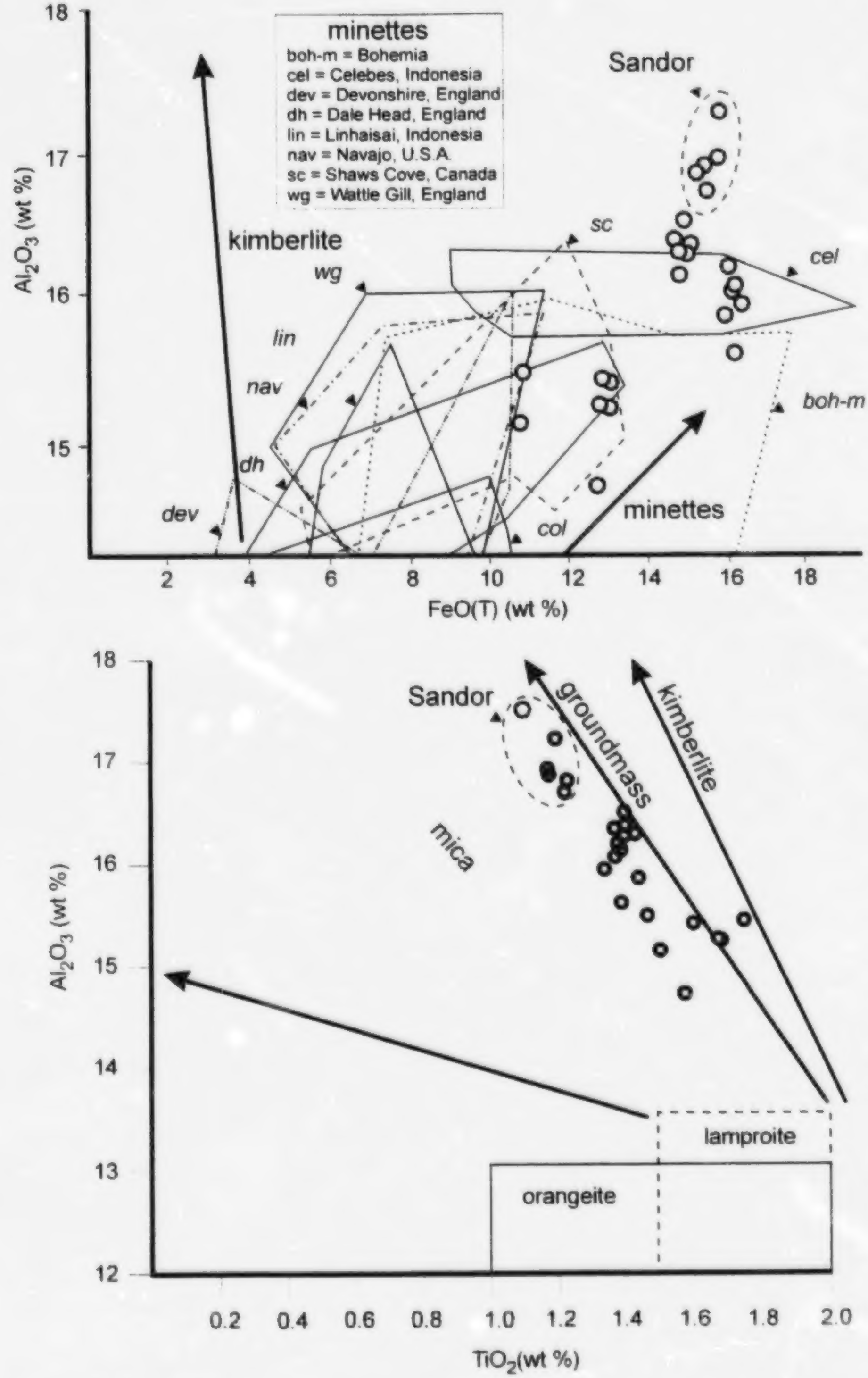

Figure 4. Mica compositions of diamond-bearing versus diamond-absent lamprophyre dikes. Field of kimberlite compositions *from* Mitchell (1995).

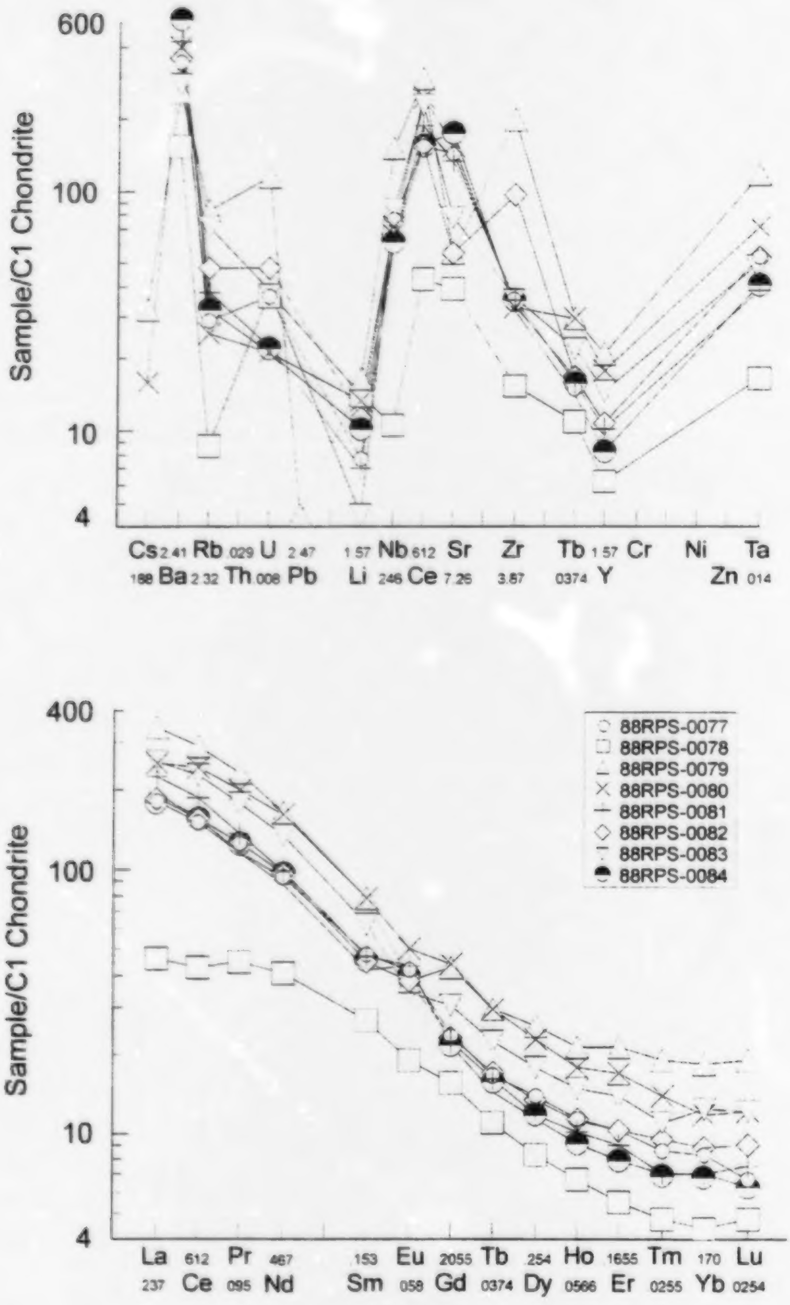

Figure 7. Chondrite-normalized rare earth element (REE) diagrams and extended trace element "spider" diagrams for the Dickenson Lake stock (data *from* Sage 1994).

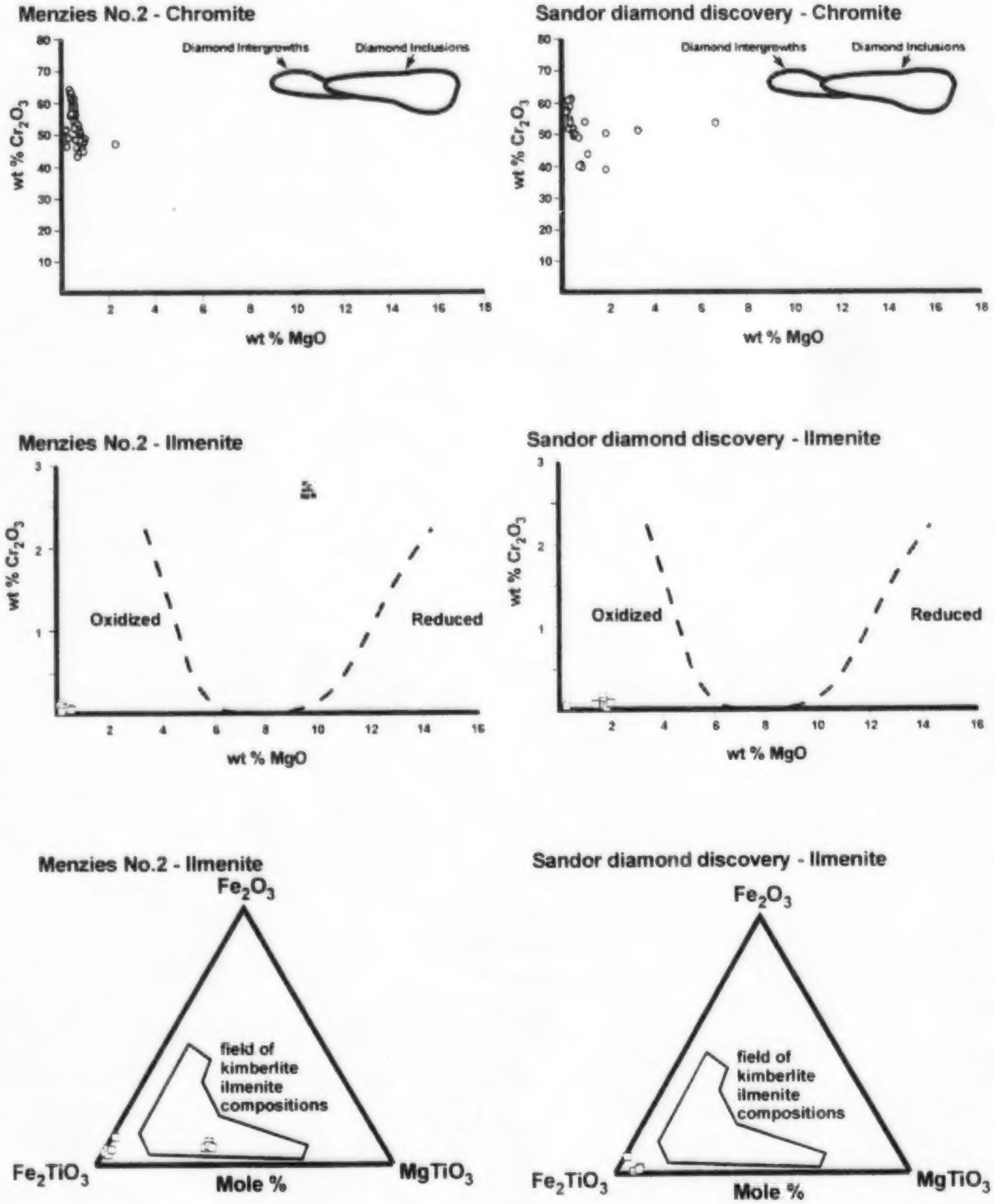

Figure 8. Chromite and ilmenite compositions of diamond-bearing lamprophyres with respect to kimberlite.

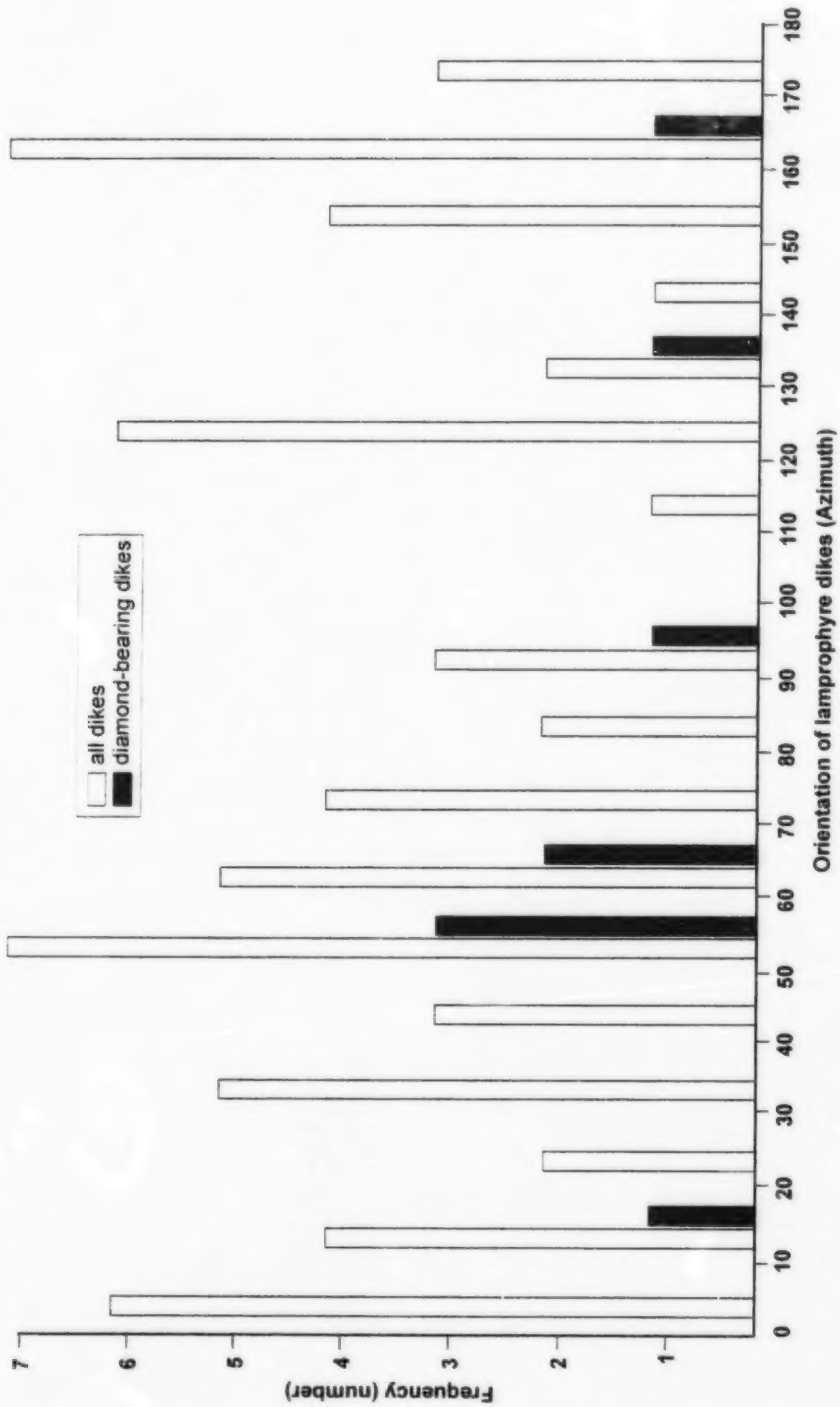

Figure 9. Orientation of lamprophyre dikes favourable to hosting diamond (*modified from* Thomas 1998).

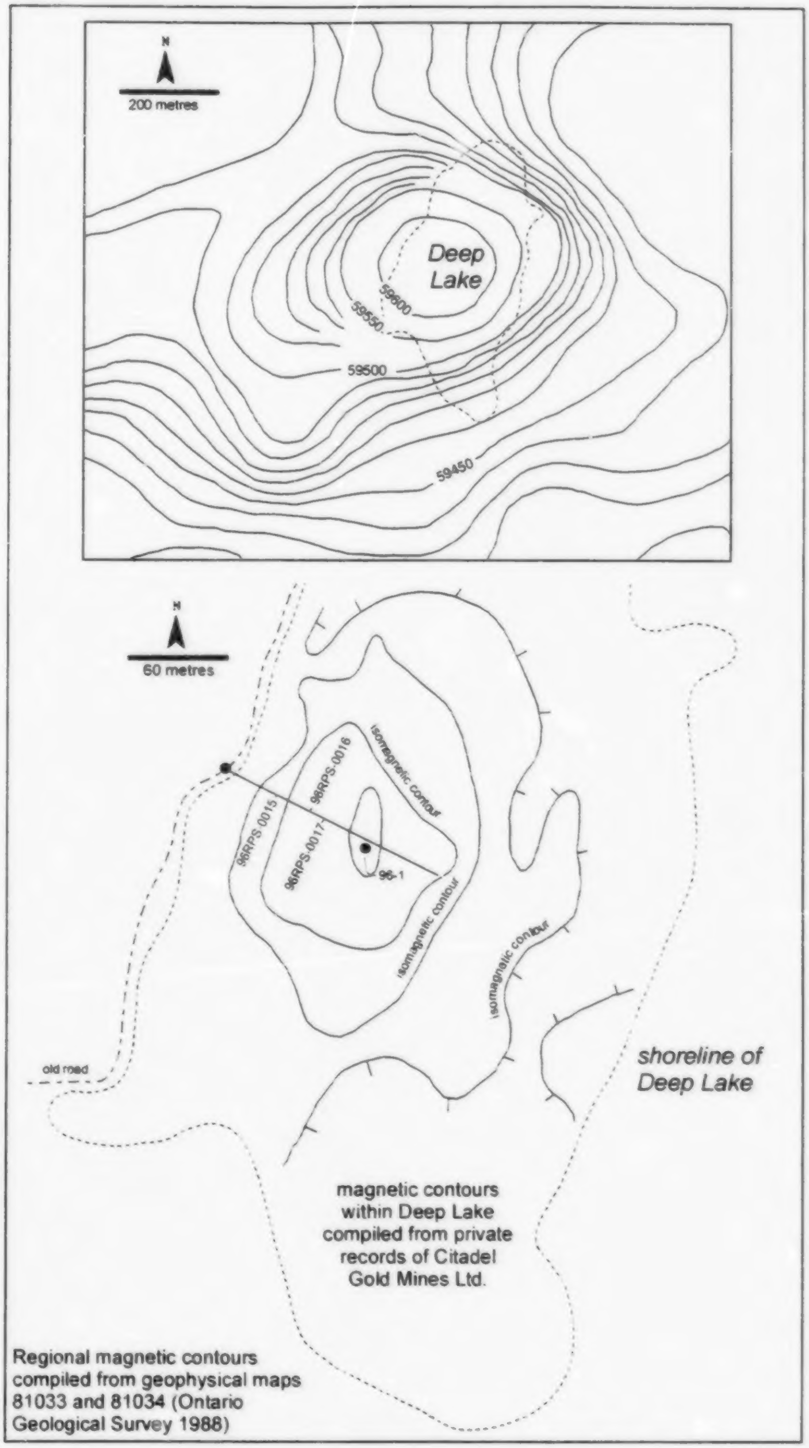

Figure 10. Isomagnetic contour and sample location map for the Deep Lake mafic to ultramafic intrusion.

Photo 1. Location P-1, exposure of the "Sandor" diamond occurrence in a roadcut along highway 17.

Photo 2. Location P-2. exposure of diamond-bearing dike along highway 17, Menzies No. 2 site. This dike has the appearance of being more like a tuffaceous unit than a clearly defined dike.

Photo 3. Location P-1, "Sandor" diamond occurrence. Inclusions weathering in relief on surface of lamprophyre dike.

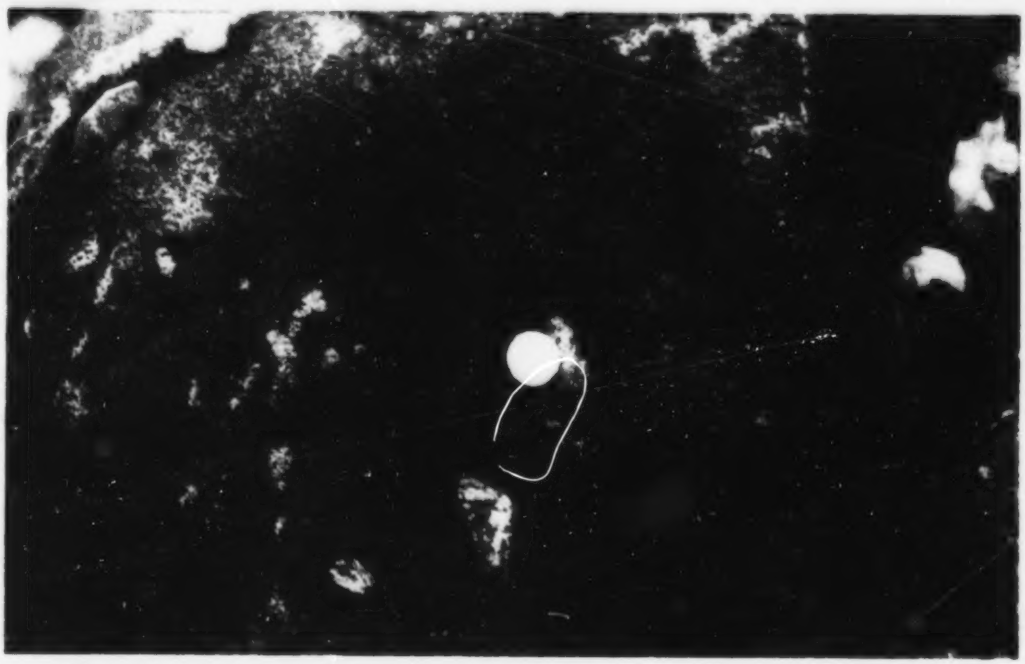

Photo 4. Location P-3, inclusion-bearing lamprophyre with well-developed biotite-rich reaction halos.

Photo 5. Location P-4, densely packed inclusions of actinolite with minor talc. Narrow rims of talc envelop the rounded inclusions. This may be a composite dike with the densely packed dike material cutting lamprophyre dike material with scattered inclusions (*see* Photos 3 and 4)(samples 97RPS-0010, 97RPS-0011, 97RPS-0012).

Photo 6. Location P-5, contact between two similar appearing inclusion-bearing lamprophyre dikes.

Photo 7. Location P-6, diatreme breccia with angular fragments of inclusion-bearing lamprophyre that is the favourable host for diamond.

Photo 8. Location P-7, Dubreuilville dike. Rounded inclusion with narrow dark reaction rim. Fine-grained actinolite rim and talc core (sample 97RPS-0007).

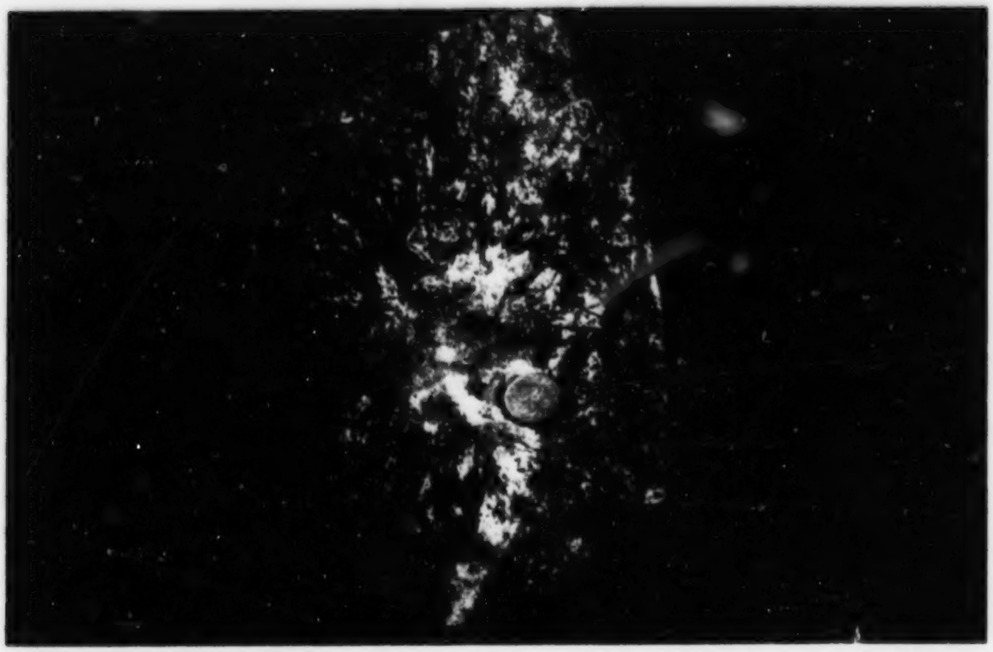

Photo 9. Location P-7, Dubreuilville dike. Radiating actinolite crystals projecting into talc core (sample 97RPS-0006).

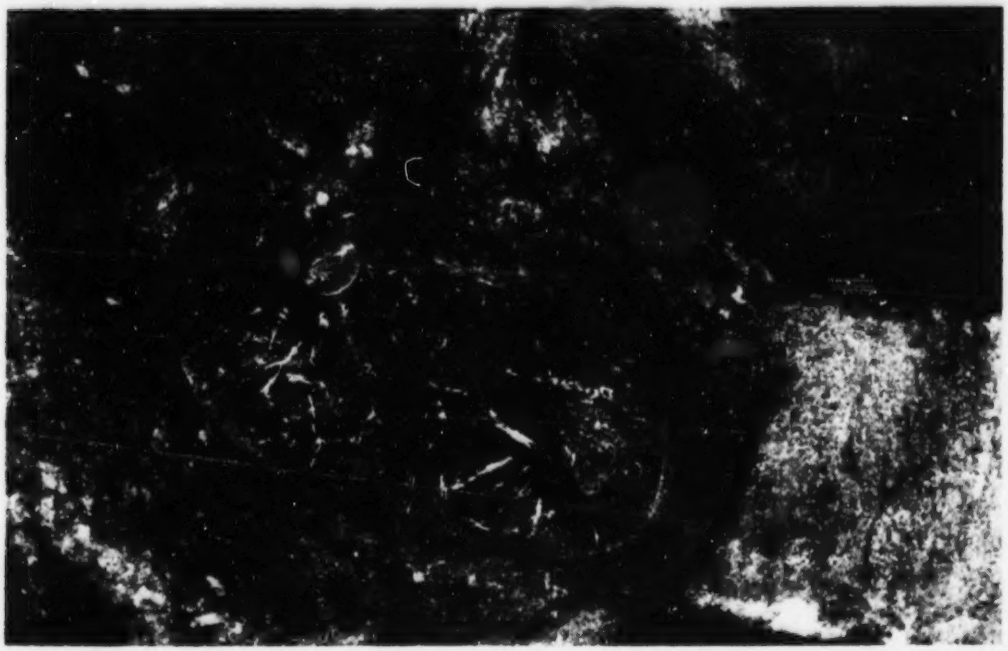

Photo 10. Location P-1, "Sandor" diamond occurrence. Rounded inclusion of coarse-grained actinolite (sample 97RPS-0011).

Photo 11. Location P-1, "Sandor" diamond occurrence. Banded amphibolite xenolith.

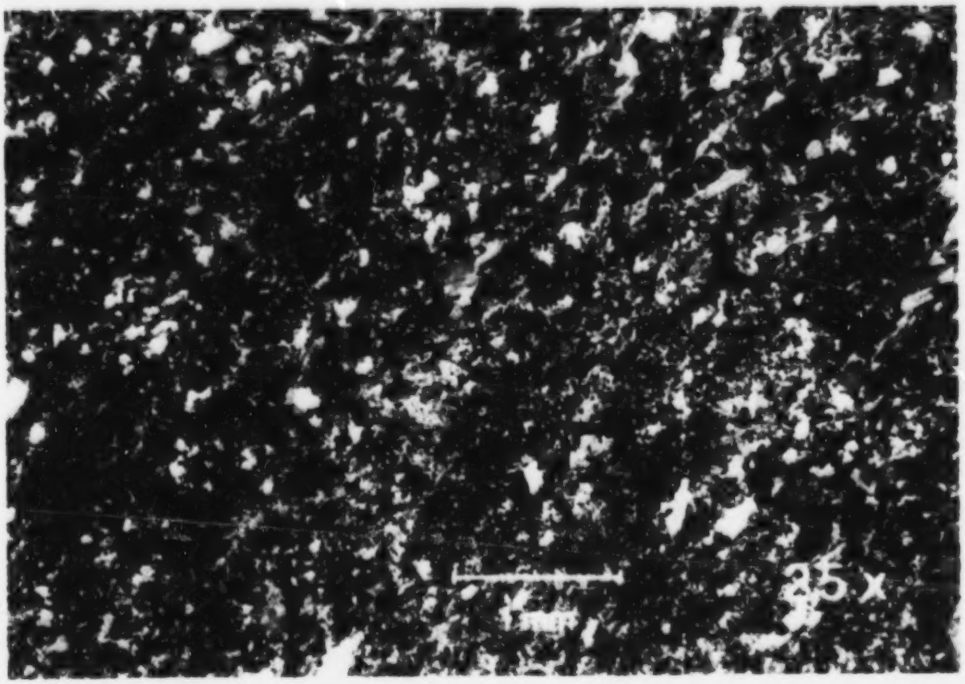

Photo 12. Photomicrograph of thin section showing fine-grained texture of lamprophyre dike in the Cruise Lake area, location P-5.

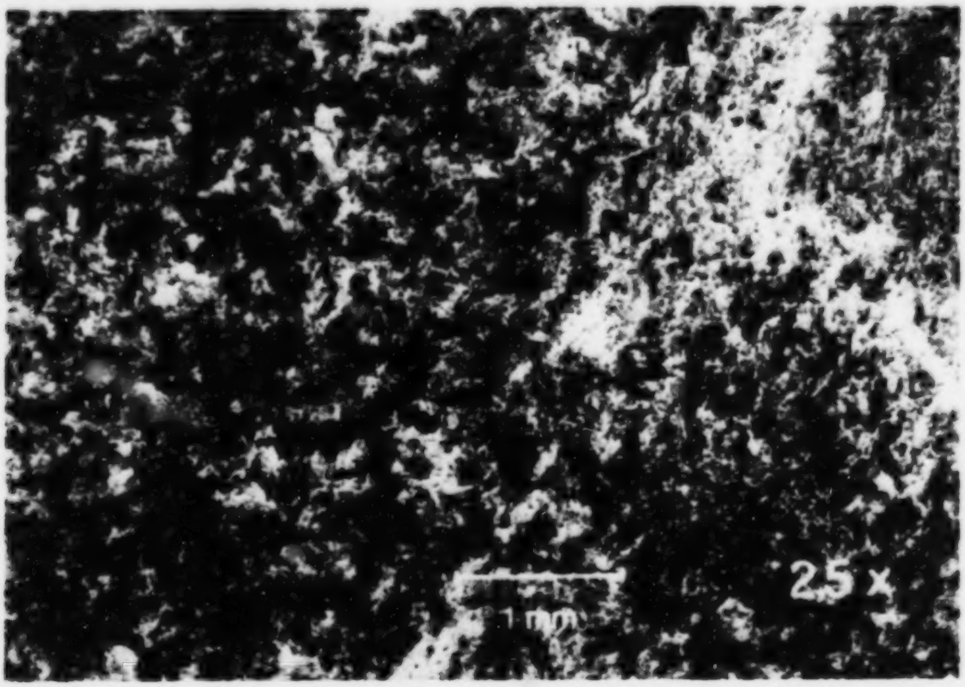

Photo 13. Photomicrograph of thin section showing fine-grained texture of lamprophyre dike at the "Sandor" diamond occurrence, location P-1.

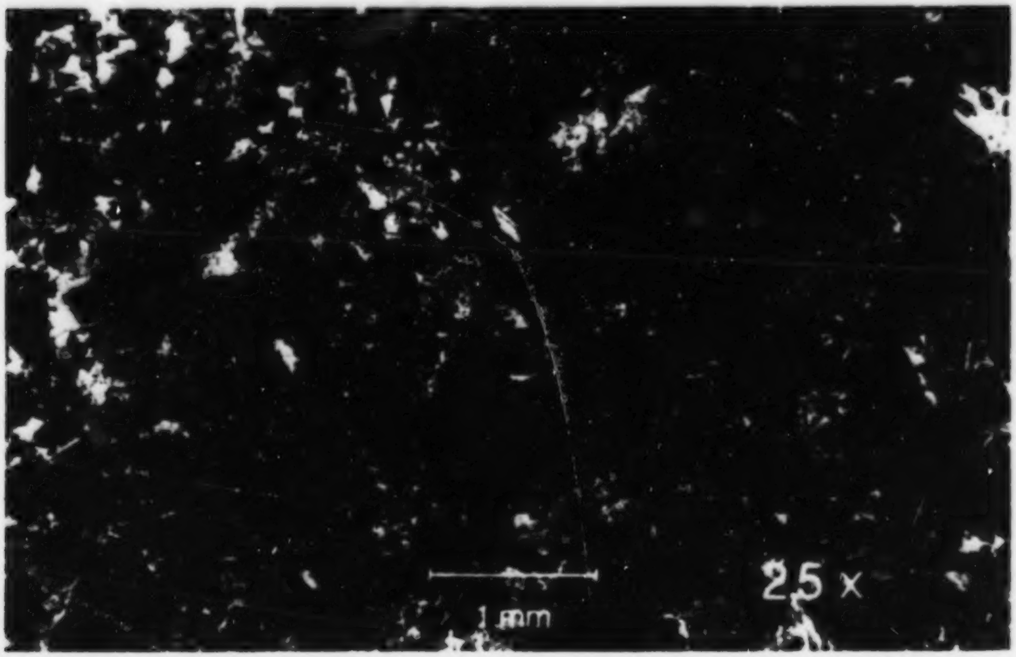

Photo 14. Photomicrograph of thin section showing coarser grained texture of lamprophyre dike at Dubreuilville, location P-7.

Photo 15. Scanning electron microscope image of a multiple-twinned, clear diamond recovered from matrix sample collected from outcrop by the Ontario Geological Survey at the "Sandor" diamond occurrence.

Table 1. Brief thin section descriptions of a select group of samples related to the "Sandor" diamond discovery. Samples collected from outcrop in 1996 and 1997 from sites identified by KWG Resources Incorporated.

Sandor 1: amphibolite
Outcrop: The specimen represents the fine-grained dike matrix at the site of the original diamond discovery in a roadcut along highway 17 approximately 0.55 km north of Wasp Lake; east side. The dike contains isolated, large rounded xenoliths, up to 1/3 m, of fine- to coarse-grained actinolite and supracrustal fragments.
Description: Amphibole is present as anhedral fibrous or prismatic appearing grains. Actinolitic-appearing amphibole is present in elliptical clots; some clots may contain epidote. Feldspar is very fine grained and interlocking with amphibole and biotite. The biotite is present as anhedral platy to tabular grains. The texture is very fine-grained equigranular granoblastic to decussate. The specimen is too fine grained for good optical examination.

Sandor 2: banded amphibolite
Outcrop: The specimen is of a banded, folded, angular, supracrustal(?) xenolith within the diamond discovery outcrop. The dimensions are approximately 48 by 30 cm.
Description: Amphibole is fibrous in appearance, possibly actinolite. Anhedral feldspar is very fine-grained equigranular and interlocking with amphibole and biotite. Biotite forms tabular subhedral brown grains. Minor quantities of opaques are anhedral to subhedral in form and disseminated throughout. Carbonate forms anhedral interlocking grains that are generally larger in size than the other minerals. The banding is due to concentrations of opaques and carbonate. The rock displays a very fine- to fine-grained equigranular granoblastic texture.

Sandor 3: amphibolite
Outcrop: A matrix specimen was collected at the margin of a large coarse-grained actinolite xenolith. The texture appeared slightly coarser grained and slightly darker in color than matrix away from the xenolith. The rounded xenolith was approximately 20 by 25 cm in outline.
Description: Fibrous actinolite is abundant. Anhedral brown biotite is common as tabular grains. Feldspar(?) is anhedral very fine grained and interstitial to the amphibole and biotite. Trace amounts of opaques and some chlorite alteration is present. The texture is fine-grained equigranular granoblastic. The rock is similar to matrix sample Sandor 1, but somewhat coarser in grain size, suggesting that the mineralogy of the matrix marginal to the xenoliths was more susceptible to regional metamorphism than matrix internal to the dike.

Dubreuilville: amphibolite
Outcrop: Lamprophyre dike exposed on west side of highway 17 roadcut approximately 3 km south of Dubreuilville turnoff, Lalibert Township. Dike contains rounded mafic xenoliths up to 1/3 m in size of fine-grained actinolite and medium- to coarse-grained talc plus actinolite. Some of the talc plus actinolite xenoliths display mineralogical zoning with actinolite rims and talc cores. The matrix sample was collected from the area of the dike that appeared xenolith free. The dike is not known to contain diamond.
Description: Amphibole is present as anhedral to euhedral grains that commonly display twin planes in the larger grains. Minor amount of interstitial carbonate. Feldspar is present as anhedral interstitial grains interlocking with amphibole and biotite. The mica is biotite of anhedral shape interlocking with the feldspar and amphibole. The sample displays a fine-grained equigranular decussate texture. The grain size is larger than that observed within the discovery dike and this dike may represent a slightly higher metamorphic grade. The discovery dike is located well within the Michipicoten greenstone belt while the Dubreuilville dike is within a few kilometres of the greenstone–granite contact.

Menzies No. 1: amphibolite
Outcrop: The outcrop occurs in a roadcut on the east side of highway 17 approximately 1.7 km south of the Lalibert–Menzies townships boundary. The dike is not known to contain diamond. The outcrop contains rounded mafic xenoliths of talc plus actinolite and talc plus carbonate plus actinolite up to 1.0 m in diameter. Sample is from the dike matrix.
Description: Amphibole occurs as anhedral to subhedral fibrous grains. The feldspar is anhedral and interstitial to the amphibole and biotite. Biotite is abundant as anhedral to subhedral grains interlocking with amphibole and feldspar. Trace amounts of apatite and chlorite alteration. The specimen has a fine-grained equigranular decussate texture. The grain size is slightly greater than the matrix grain size in the discovery outcrop.

C-1: amphibole
Outcrop: The outcrop occurs on the north side of four-wheel drive logging skid road south to southwest of Cruise Lake. The dike contains rounded, isolated, actinolite-rich clasts up to 36 by 23 cm in a fine-grained matrix. Sample is from the dike matrix. The dike is not known to contain diamond.
Description: Biotite is anhedral to subhedral in outline and interlocking with feldspar and amphibole. Amphibole is anhedral to subhedral in shape and sometimes has a fibrous appearance. The feldspar is very fine grained, anhedral and present as interlocking grains with amphibole and biotite. The rock texture is fine-grained equigranular decussate. The matrix grain size is slightly coarser than the diamond discovery outcrop.

C-2A: altered mafic dike
Outcrop: The outcrop occurs along the west side of a four-wheel drive logging skid road east of Cruise Lake. The dike sampled is a biotite-rich late lamprophyre dike that crosscuts the xenolith-bearing dike set that hosts diamond (*see* sample C-2B).
Description: Biotite is present as anhedral to subhedral grains that are distinctly clotty and concentrated into elongated elliptical clots. The mica in these clots is slightly coarser grained than the mica found within the enclosing matrix. Feldspar is anhedral in outline and forms grains interlocking with the biotite. Trace of opaques. The matrix consists of a very fine-grained granoblastic mixture of biotite, feldspar and amphibole(?). The specimen displays a very, very fine-grained inequigranular seriate decussate texture. The rock may have been subjected to deformation.

Table 1. continued.

C-2B: amphibolite
Outcrop: This specimen is from the matrix of the xenolith-bearing dike typical of dikes hosting diamond. The dike is not known to host diamond (*see* sample C-2A).
Description: Amphibole occurs as anhedral to subhedral grains. Birefringence on several of the larger amphibole grains suggests the possibility of compositional zonation. Anhedral to subhedral biotite may occur in clots as well as being a major rock-forming mineral. Some chloritic alteration may be present and, rarely, the somewhat larger grains may display bent (001) cleavage. The feldspar forms anhedral grains interlocking with the mica and amphibole. The texture is fine-grained equigranular decussate with some biotite clotting. The matrix grain size is slightly coarser than the diamond discovery outcrop.

C-4A: altered mafic dike
Outcrop: This outcrop occurs along the east side of a four-wheel drive logging skid road on the east side of Cruise Lake approximately 0.65 km north of the site of sample C-2. The dike sampled is a biotite-rich late lamprophyre dike that crosscuts the xenolith-bearing dike set that hosts diamond (*see* sample C4-B).
Description: Biotite is abundant as elliptical or elongated clots. Feldspar is present as very fine anhedral grains. The feldspar may occur as a slightly coarser grained aggregate of grains and appear clotty or segregated as the mica. Trace amounts of a subhedral opaque mineral. The very fine-grained matrix consists of a mixture of biotite, feldspar and amphibole(?). The rock texture is very fine- to fine-grained inequigranular seriate decussate.

C-4B: amphibolite
Outcrop: This sample is from the matrix of the xenolith-bearing dike known to be favourable for the presence of diamond. This dike is not known to contain diamond (*see* sample C-4A).
Description: Feldspar forms grains interlocking with the biotite and amphibole. The amphibole is anhedral to subhedral in outline with somewhat ragged or fibrous ends. The somewhat larger amphibole may contain very tiny poikilitic inclusions. Biotite is anhedral to subhedral in outline and somewhat clotty in appearance. The biotite grains occurring in clots display a tendency to be somewhat larger than those occurring in the surrounding matrix. There are trace amounts of disseminated anhedral opaque grains. The texture is fine-grained equigranular decussate. The matrix grain size is slightly larger than the diamond discovery outcrop.

C-7: amphibolite
Outcrop: The outcrop occurs on the south side of a four-wheel drive logging skid road approximately 0.65 km west of a collapsed bridge over a creek draining into the northwest corner of McCormick Lake. The dike is composite in nature or consists of two separate distinct dike phases. One phase consists of densely packed medium- to coarse-grained rounded xenoliths of actinolite with minor talc and the second is represented by isolated actinolite xenoliths in a fine-grained matrix. The phase consisting of rounded isolated actinolite-rich xenoliths in a fine-grained matrix is typical of diamond-bearing host dikes. The sample is from the matrix of the dike displaying isolated xenoliths. The dike is not known to contain diamond.
Description: Biotite is abundant as anhedral to subhedral grains interlocking with amphibole and plagioclase. The amphibole is pleochroic in green and brown and some of the slightly larger grains may contain tiny poikilitic inclusions. Rounded elliptical clots of actinolite are also present. Feldspar forms anhedral grains interlocking with the mica and amphibole. The texture of the specimen is fine-grained equigranular decussate. The matrix grain size is slightly larger than that observed in the diamond discovery outcrop.

DEEP LAKE
Deep Lake 195 ft.: altered pyroxenite
Biotite is abundant as anhedral to subhedral tabular grains that often occur in aggregates. Actinolite is abundant as prismatic fibres. Traces of interstitial plagioclase. Very fine-grained talc, carbonate and serpentine(?) replace the primary mineralogy. The sample is a matted fibrolite.

Deep Lake 325 ft.: altered pyroxenite to peridotite
Biotite and chlorite after biotite are major components of the specimen. Opaques as anhedral to euhedral grains are disseminated throughout the sample. Very fine-grained prismatic to fibrous mineral is likely actinolite. Very fine-grained carbonate, talc and serpentine replace the primary mineralogy. The texture is micaceous matted to fine-grained granoblastic. Some circular structures may represent the outlines of former olivine grains. The biotite–chlorite is interstitial to the circular structures and could represent replacement of former pyroxene oikocryst enclosing the former olivine since single biotite grains appear to envelope several former olivine grains.

Deep Lake 395 ft.: altered pyroxenite to peridotite
Opaques as anhedral to euhedral grains are disseminated throughout the specimen. Biotite and chlorite replacing biotite are common and single grains may enclose several circular structures that may be former olivine grains. The biotite is anhedral in form and may be replacing a former pyroxene oikocryst that enveloped the altered olivine. Very fine-grained prismatic amphibole occurs throughout the specimen. Carbonate, talc and serpentine as very fine grains occur throughout the sample replacing the primary mineralogy. The sample texture is micaceous matted to fine-grained granoblastic with textural suggestion of former olivine being present.

Table 2. Matrix mineral compositions of Wawa diamond-bearing lamprophyres.

Sample	SiO2	TiO2	Al2O3	Cr2O3	MgO	CaO	MnO	FeO	BaO	Na2O	K2O	F	Cl	SrO	NiO	Total	F=O	Cl=O	Total
Sandor mica-1	37.79	1.18	16.87	0.20	14.23	0.05	0.22	15.48	0.29	0.07	10.13	0.11	0.00	NA	NA	96.61	-0.05	0.00	96.56
Sandor mica-2	38.08	1.23	16.81	0.48	14.15	0.08	0.09	15.27	0.22	0.05	10.06	0.16	0.03	NA	NA	96.73	-0.07	-0.01	96.65
Sandor mica-3	37.73	1.19	17.22	0.15	14.16	0.06	0.18	15.86	0.21	0.06	10.23	0.24	0.02	NA	NA	97.32	-0.10	-0.01	97.21
Sandor mica-4	38.29	1.22	16.70	0.20	14.30	0.05	0.15	15.53	n.d.	0.10	9.94	0.21	0.02	NA	NA	96.71	-0.09	0.00	96.61
Sandor mica-5	37.40	1.17	16.92	0.15	13.91	0.01	0.13	15.80	0.29	0.06	10.16	0.15	0.02	NA	NA	96.17	-0.06	-0.01	96.10
Sandor amp-1	55.51	0.00	1.64	0.09	18.15	12.87	0.25	9.36	n.d.	0.21	0.05	0.05	0.00	NA	NA	98.18	-0.02	0.00	98.16
Sandor amp-2	53.93	0.07	2.74	0.11	17.32	12.97	0.26	9.73	n.d.	0.26	0.35	0.01	0.01	NA	NA	97.77	0.00	0.00	97.76
Sandor amp-3	53.94	0.16	2.95	0.12	17.25	12.65	0.23	10.37	n.d.	0.35	0.11	0.00	0.00	NA	NA	98.13	0.00	0.00	98.13
Sandor epidote-1	37.85	0.05	23.09	0.02	0.00	22.82	0.04	13.71	n.d.	0.00	0.00	0.02	0.00	NA	NA	97.60	-0.01	0.00	97.59
Sandor fsp-1	67.69	0.00	20.13	NA	0.02	1.01	NA	0.30	0.01	10.93	0.04	NA	NA	0.00	NA	100.14			
Sandor fsp-2	68.87	0.00	19.52	NA	0.00	0.35	NA	0.16	0.00	11.31	0.01	NA	NA	0.00	NA	100.22			
Sandor fsp-3	67.19	0.00	20.50	NA	0.00	1.35	NA	0.09	0.03	10.59	0.00	NA	NA	0.02	NA	99.78			
BAG1-1 garnet	37.73	0.08	20.69	0.00	5.58	6.17	1.11	27.85	NA	0.01	0.00	NA	NA	NA	0.09	99.32			
BAG1-2 garnet	38.22	0.06	21.83	0.03	10.27	1.19	0.34	27.08	NA	0.01	0.00	NA	NA	NA	0	99.04			
Menzies-1 mica-1	39.09	1.46	15.48	0.36	18.13	0.07	0.04	10.88	0.27	0.16	9.78	0.07	0.01	NA	NA	95.82	-0.03	0.00	95.79
Menzies-1 mica-2	39.20	1.50	15.15	0.47	18.06	0.05	0.11	10.80	n.d.	0.13	9.64	0.08	0.01	NA	NA	95.21	-0.03	0.00	95.17
Menzies-1 amp-1	57.73	0.03	0.53	0.03	21.07	11.87	0.26	6.20	n.d.	0.34	0.05	0.00	0.01	NA	NA	98.13	0.00	0.00	98.13
Menzies-1 amp-2	56.79	0.06	1.27	0.04	20.51	12.71	0.16	6.07	n.d.	0.29	0.00	0.02	0.00	NA	NA	97.91	-0.01	0.00	97.90
Menzies-1 chlorite-1	28.73	0.05	20.29	0.26	26.10	0.01	0.11	11.64	n.d.	0.00	0.15	0.05	0.03	NA	NA	87.41	-0.02	-0.01	87.38
Menzies fsp-1	68.61	0.00	19.56	NA	0.00	0.28	NA	0.13	0.00	11.31	0.01	NA	NA	0.00	NA	99.91			
Menzies fsp-2	68.57	0.01	19.43	NA	0.00	0.30	NA	0.11	0.00	11.23	0.02	NA	NA	0.00	NA	99.67			
Dubreuilville mica-1c	38.51	1.68	15.25	0.14	16.84	0.07	0.11	13.05	0.42	0.15	9.76	0.18	0.00	NA	NA	96.14	-0.07	0.00	96.06
Dubreuilville mica-1r	38.55	1.60	15.41	0.08	16.84	0.02	0.07	13.09	0.66	0.13	9.76	0.10	0.02	NA	NA	96.33	-0.04	0.00	96.29
Dubreuilville mica-2	38.29	1.75	15.44	0.18	16.87	0.06	0.06	12.90	0.60	0.11	9.67	0.14	0.02	NA	NA	96.10	-0.06	-0.01	96.04
Dubreuilville mica-3	38.18	1.67	15.26	0.15	16.91	0.06	0.10	12.83	0.41	0.14	9.57	0.14	0.00	NA	NA	95.41	-0.06	0.00	95.35
Dubreuilville mica-4	39.14	1.58	14.72	0.17	17.29	0.05	0.10	12.74	0.39	0.14	9.76	0.16	0.00	NA	NA	96.22	-0.07	0.00	96.16
Dubreuilville amp-1	54.07	0.16	3.08	0.25	17.47	12.45	0.23	9.33	n.d.	0.43	0.13	0.08	0.01	NA	NA	97.68	-0.03	0.00	97.65
Dubreuilville amp-2	55.81	0.08	1.39	0.04	19.38	12.45	0.15	7.64	n.d.	0.34	0.10	0.07	0.00	NA	NA	97.46	-0.03	0.00	97.43
Dubreuilville amp-3	55.56	0.04	2.06	0.10	18.75	12.81	0.20	7.90	n.d.	0.37	0.14	0.06	0.00	NA	NA	97.98	-0.03	0.00	97.96
Dubreuilville fsp-1	67.54	0.02	20.26	NA	0.02	0.80	NA	0.19	0.08	10.74	0.04	NA	NA	0.74	NA	100.43			
Dubreuilville fsp-2	67.52	0.02	20.28	NA	0.00	0.77	NA	0.18	0.02	10.79	0.02	NA	NA	0.48	NA	100.07			
Dubreuilville fsp-3	67.13	0.00	20.07	NA	0.00	1.12	NA	0.19	0.01	10.70	0.00	NA	NA	0.59	NA	99.80			
Dubreuilville fsp-4	67.80	0.12	19.87	NA	0.00	0.56	NA	0.12	0.03	10.92	0.00	NA	NA	0.42	NA	99.84			
C2B mica-1c	37.55	1.43	16.29	0.11	0.30	14.40	0.01	0.14	14.82	0.13	0.22	0.03	10.48	0.22	0.01	96.14			
C2B mica-1r	37.44	1.37	16.34	0.09	0.55	14.29	0.01	0.16	15.11	0.09	0.26	0.07	10.65	0.21	0.01	96.65			
C2B mica-2c	37.62	1.40	16.50	0.07	0.19	14.33	0.00	0.16	14.96	0.08	0.23	0.11	10.45	0.25	0.02	96.37			

Table 2. continued.

Sample	SiO2	TiO2	Al2O3	Cr2O3	MgO	CaO	MnO	FeO	BaO	Na2O	K2O	F	Cl	SrO	NiO	Total
C2B mica-2r	37.54	1.40	16.27	0.10	0.23	14.31	0.04	0.16	15.05	0.12	0.22	0.09	10.33	0.18	0.01	96.05
C2B mica-3c	36.96	1.39	16.13	0.09	0.25	14.02	0.00	0.14	14.85	0.08	0.32	0.05	10.30	0.05	0.00	94.63
C2B mica-3r	37.47	1.40	16.37	0.10	0.25	14.19	0.00	0.17	14.72	0.11	0.17	0.06	10.34	0.13	0.03	95.51
C2B amp-1c	54.54	0.12	1.68	0.00	0.10	18.14	11.67	0.21	8.88	0.04	0.00	0.15	0.86	0.12	0.01	96.52
C2B amp-1r	55.81	0.03	1.13	0.09	0.05	18.38	12.74	0.23	8.60	0.03	0.05	0.17	0.13	0.04	0.00	97.48
C2B amp-2c	51.95	0.29	4.29	0.08	0.18	16.10	12.23	0.20	10.99	0.04	0.08	0.58	0.32	0.10	0.00	97.43
C2B amp-2r	51.80	0.43	4.27	0.07	0.22	15.93	12.22	0.24	10.75	0.07	0.05	0.59	0.32	0.09	0.01	97.06
C2B amp-3c	53.34	0.10	2.95	0.03	0.13	17.20	12.52	0.25	9.88	0.03	0.09	0.42	0.24	0.00	0.01	97.19
C2B amp-3r	52.81	0.12	3.86	0.00	0.02	16.58	12.55	0.28	10.60	0.06	0.05	0.45	0.28	0.06	0.00	97.72
C2B amp-4c	54.66	0.02	1.74	0.00	0.03	18.12	12.68	0.25	9.00	0.08	0.10	0.25	0.13	0.09	0.01	97.16
C2B amp-4r	50.54	0.34	5.22	0.01	0.13	15.65	12.16	0.24	11.47	0.04	0.07	0.81	0.49	0.00	0.00	97.17
C2B plag-1	67.59	0.00	19.94	NA	NA	0.76	NA	0.12	0.01	11.67	0.00	NA	NA	0.21	NA	100.30
C2B plag-2	67.66	0.03	19.45	NA	NA	0.34	NA	0.07	0.02	11.96	0.03	NA	NA	0.09	NA	99.65
C2B plag-3	68.31	0.06	19.35	NA	NA	0.20	NA	0.06	0.01	11.98	0.01	NA	NA	0.07	NA	100.03
C2B plag-4	68.18	0.01	19.31	NA	NA	0.20	NA	0.06	0.01	12.19	0.01	NA	NA	0.05	NA	100.03
C4B mica-1c	37.13	1.44	15.86	0.04	0.29	13.50	0.00	0.17	15.96	0.08	0.08	0.11	10.51	0.16	0.01	95.34
C4B mica-1r	36.70	1.39	15.61	0.07	0.20	13.79	0.06	0.21	16.21	0.05	0.00	0.07	9.95	0.14	0.01	94.46
C4B mica-2c	36.92	1.37	16.06	0.08	0.16	13.47	0.08	0.17	16.23	0.07	0.22	0.07	10.51	0.16	0.03	95.60
C4B mica-2r	36.94	1.34	15.94	0.07	0.15	13.63	0.03	0.17	16.39	0.06	0.13	0.07	10.43	0.12	0.01	95.48
C4B mica-3c	37.24	1.40	16.02	0.02	0.15	13.58	0.03	0.16	16.15	0.07	0.26	0.07	10.72	0.18	0.00	96.05
C4B mica-3r	37.36	1.38	16.19	0.06	0.20	13.59	0.03	0.17	16.06	0.07	0.17	0.08	10.67	0.12	0.01	96.16
C4B amp-1c	51.20	0.15	4.53	0.03	0.24	15.28	12.41	0.24	12.05	0.02	0.13	0.54	0.37	0.04	0.01	97.24
C4B amp-1r	51.44	0.22	4.20	0.07	0.10	15.44	12.32	0.24	11.93	0.08	0.07	0.52	0.38	0.10	0.01	97.12
C4B amp-2	52.65	0.10	3.25	0.03	0.18	16.40	12.35	0.24	10.72	0.03	0.02	0.39	0.25	0.03	0.00	96.64
C4B amp-3	52.59	0.26	3.58	0.07	0.06	15.89	12.35	0.24	11.35	0.01	0.06	0.43	0.31	0.13	0.01	97.34
C4B kspar-1	62.64	0.00	18.51	NA	NA	0.00	NA	0.08	2.71	0.25	15.44	NA	NA	0.00	NA	99.63
C4B plag-1	68.01	0.03	19.36	NA	NA	0.33	NA	0.08	0.02	11.86	0.17	NA	NA	0.07	NA	99.93
C4B plag-2	67.83	0.00	19.43	NA	NA	0.24	NA	0.11	0.01	11.91	0.11	NA	NA	0.09	NA	99.73
C4B plag-3	67.65	0.01	19.31	NA	NA	0.28	NA	0.08	0.00	12.00	0.08	NA	NA	0.05	NA	99.45

Notes: Sandor, diamond-bearing, discovery site; Menzies-1, diamond-absent (northeast corner of Menzies Township); Dubreuilville, diamond-absent (on highway 17 approximately 3 km south of Dubreuilville turnoff); C2B, diamond-absent (southeast of Cruise Lake); C4B, diamond-absent (east of Cruise Lake); FeO for feldspar in C2B and C4B reported as Fe2O3; n.d., not detected; NA, not analyzed.

Table 3. Geochemical data on matrix of diamond-bearing lamprophyre dikes.

Sample	SiO2	Al2O3	Fe2O3	FeO	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO	CO2	S	H2O+	H2O-	LOI	Total
96RPS-0012	47.30	8.88	9.57	6.60	20.00	6.43	0.34	3.98	0.69	0.28	0.14	0.14	N.D.	3.63	0.30	2.91	100.51
96RPS-0013	46.82	10.92	11.05	8.15	11.93	9.00	1.71	3.71	0.93	0.34	0.17	1.96	N.D.	1.98	0.15	3.38	99.95
96RPS-0014	48.33	9.97	10.13	6.84	13.61	8.97	2.05	2.83	0.89	0.34	0.16	1.60	0.03	1.95	0.18	2.86	100.15
97RPS-0002	48.98	11.62	10.85	6.44	11.39	9.05	1.96	2.94	1.06	0.22	0.17	0.64	N.D.	2.00	0.14	1.65	99.89
97RPS-0004	48.94	10.36	10.84	6.81	9.75	8.33	1.46	4.16	1.41	0.51	0.14	1.75	0.02	1.98	0.21	2.90	98.80
Late lamprophyre dikes that intrude diamond-bearing lamprophyre dike set.																	
97RPS-0001	50.19	14.73	11.15	5.36	6.70	7.81	1.54	3.75	1.22	0.36	0.22	0.18	0.03	1.93	0.10	1.35	99.02
97RPS-0003	50.84	14.92	10.96	5.18	6.68	8.44	0.49	4.00	1.20	0.31	0.17	0.14	0.11	2.03	0.15	1.32	99.33

Sample	Ag	Cd	Be	Co	Cu	Mo	Ni	Sc	V	W	Zn	As	Ba	Cr	Pb	Y	Zr	Ga	Sn
96RPS-0012	2	N.D.	N.D.	57	13	N.D.	782	19	163	N.D.	88	N.D.	535	1097	N.D.	17	96	13	N.D.
96RPS-0013	4	N.D.	N.D.	47	45	N.D.	375	26	201	N.D.	98	N.D.	774	666	N.D.	20	88	14	N.D.
96RPS-0014	3	N.D.	N.D.	47	48	N.D.	473	23	185	N.D.	101	N.D.	1205	719	N.D.	17	109	13	N.D.
97RPS-0002	3	N.D.	N.D.	48	17	N.D.	359	24	202	N.D.	111	N.D.	931	602	12	21	120	NA	NA
97RPS-0004	3	N.D.	N.D.	44	62	N.D.	275	23	189	N.D.	120	N.D.	959	544	8	22	144	NA	NA
Late lamprophyre dikes that intrude diamond-bearing lamprophyre dike set.																			
97RPS-0001	3	N.D.	N.D.	37	45	N.D.	116	23	187	N.D.	110	N.D.	905	199	13	26	143	NA	NA
97RPS-0003	3	N.D.	N.D.	37	52	N.D.	124	24	188	N.D.	134	N.D.	538	209	19	24	143	NA	NA

Sample	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Rb	Sr	Nb	Cs	Hf	Ta	Th	U
96RPS-0012	16.50	37.01	5.03	21.32	4.86	1.48	4.41	0.61	3.03	0.55	1.47	0.20	1.31	0.20	125.87	148.2	1.58	5.80	2.35	0.12	2.59	0.63
96RPS-0013	17.09	39.21	5.53	23.95	5.34	1.61	4.87	0.68	3.59	0.70	1.92	0.26	1.67	0.24	143.74	432.5	4.09	5.75	1.80	0.21	2.37	0.59
96RPS-0014	28.11	63.80	8.81	36.34	7.43	2.13	6.18	0.82	3.73	0.66	1.77	0.24	1.53	0.23	91.75	984.5	5.15	5.07	2.72	0.26	3.59	0.82
97RPS-0002	22.06	51.91	7.04	30.76	6.36	1.68	4.82	0.61	3.68	0.67	1.85	0.26	1.58	0.24	96.94	921.4	5.20	2.33	2.21	0.25	2.63	0.60
97RPS-0004	26.88	65.88	9.05	40.74	8.79	2.23	6.52	0.82	4.41	0.79	2.03	0.26	1.65	0.24	146.27	797.1	7.83	3.45	3.21	0.35	3.40	0.96
Late lamprophyre dikes that intrude diamond-bearing lamprophyre dike set.																						
97RPS-0001	43.46	103.30	13.18	53.96	9.20	2.24	5.99	0.81	4.90	0.88	2.50	0.35	2.22	0.31	128.35	691.4	10.59	3.20	2.69	0.77	5.67	1.48
97RPS-0003	49.13	114.61	14.30	57.79	9.56	2.30	6.04	0.76	4.53	0.83	2.30	0.30	1.95	0.29	119.92	848.3	6.13	3.58	2.60	0.32	5.41	1.11

Notes: N.D., not detected; NA, not analyzed.

Table 4. Geochemical data on xenoliths within diamond-bearing lamprophyre dikes.

Sample	SiO2	Al2O3	Fe2O3	FeO	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO	CO2	S	H2O+	H2O-	LOI	Total
96-RPS-0008	56.79	2.18	5.72	4.52	27.61	0.62	N.D.	0.18	0.05	N.D.	0.05	1.03	N.D.	5.27	0.09	5.93	99.09
96-RPS-0009	51.39	3.05	6.06	4.91	27.21	2.70	N.D.	0.03	0.04	N.D.	0.12	3.98	N.D.	5.38	0.08	8.99	99.54
96-RPS-0010	55.76	1.71	5.65	4.19	21.79	11.86	0.08	0.10	0.09	N.D.	0.16	0.28	N.D.	2.82	0.11	2.72	99.89
96-RPS-0011	53.59	1.84	7.75	5.58	19.17	14.06	0.18	0.03	0.03	N.D.	0.27	1.53	N.D.	2.26	0.10	3.38	100.27
97RPS-0005	53.41	1.17	5.11	3.61	22.28	12.80	0.08	0.05	0.03	N.D.	0.18	2.93	N.D.	2.75	0.09	5.02	100.07
97RPS-0006	55.13	1.38	5.38	3.81	22.87	10.81	0.07	0.04	0.03	N.D.	0.16	1.62	N.D.	3.04	0.11	4.05	99.86
97RPS-0007	54.76	2.42	6.66	4.80	22.55	10.99	0.05	0.08	0.04	N.D.	0.17	0.23	0.02	3.23	0.10	2.44	100.10
97RPS-0008	53.81	1.87	7.10	5.08	20.34	13.35	0.14	0.04	0.04	N.D.	0.23	1.01	N.D.	2.50	0.08	2.62	99.49
97RPS-0009	54.87	1.96	6.80	4.84	20.95	12.97	0.14	0.03	0.03	N.D.	0.21	0.67	N.D.	2.58	0.08	2.42	100.33
97RPS-0010	55.34	2.10	7.50	5.12	20.43	12.57	0.23	0.07	0.06	N.D.	0.21	0.18	N.D.	2.29	0.08	1.52	99.97
97RPS-0011	55.56	2.29	7.38	4.91	20.66	12.53	0.25	0.04	0.05	N.D.	0.21	0.25	N.D.	2.43	0.15	1.89	100.80
97RPS-0012	55.79	1.61	6.69	4.53	20.94	12.15	0.20	0.04	0.03	N.D.	0.21	0.21	N.D.	2.32	0.13	1.81	99.41

Sample	Ag	Cd	Be	Co	Cu	Mo	Ni	Sc	V	W	Zn	As	Ba	Cr	Pb	Y	Zr	Ga	Sn
96-RPS-0008	N.D.	N.D.	N.D.	71	N.D.	11	1590	N.D.	35	N.D.	88	N.D.	22	1268	N.D.	4	9	4	N.D.
96-RPS-0009	N.D.	N.D.	N.D.	65	N.D.	11	1626	1	37	N.D.	84	N.D.	N.D.	1657	N.D.	4	8	5	N.D.
96-RPS-0010	N.D.	N.D.	N.D.	55	N.D.	10	1316	3	57	N.D.	57	N.D.	26	1391	8	4	10	3	N.D.
96-RPS-0011	1	N.D.	N.D.	43	N.D.	N.D.	1249	3	87	N.D.	92	N.D.	20	1646	N.D.	4	9	4	N.D.
97RPS-0005	1	N.D.	N.D.	55	15	13	1239	3	44	N.D.	69	N.D.	44	1399	17	5	13	NA	NA
97RPS-0006	1	N.D.	N.D.	54	7	13	1163	3	48	N.D.	64	N.D.	22	1381	8	5	10	NA	NA
97RPS-0007	1	N.D.	N.D.	60	16	12	1262	4	59	N.D.	75	N.D.	75	1828	18	5	10	NA	NA
97RPS-0008	2	N.D.	N.D.	55	N.D.	11	1362	3	83	N.D.	72	N.D.	N.D.	1704	N.D.	7	10	NA	NA
97RPS-0009	2	N.D.	N.D.	52	N.D.	11	1343	3	86	N.D.	59	N.D.	N.D.	1499	N.D.	5	10	NA	NA
97RPS-0010	2	N.D.	N.D.	52	6	N.D.	1205	3	103	N.D.	79	N.D.	53	1279	13	7	10	NA	NA
97RPS-0011	2	N.D.	N.D.	57	6	9	1242	2	105	N.D.	91	N.D.	8	1354	36	7	10	NA	NA
97RPS-0012	2	N.D.	N.D.	56	N.D.	12	1241	2	83	N.D.	92	N.D.	17	1412	8	5	9	NA	NA

Sample	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Rb	Sr	Nb	Cs	Hf	Ta	Th	U
96-RPS-0008	1.10	2.89	0.44	2.09	0.41	0.10	0.25	0.02	0.11	0.01	0.04	N.D.	0.05	0.01	5.18	54.0	0.14	0.35	0.08	0.04	0.19	0.02
96-RPS-0009	6.42	15.23	2.14	8.74	1.48	0.41	0.80	0.08	0.23	0.03	0.11	0.01	0.12	0.02	0.96	229.7	0.11	0.11	0.03	0.03	0.37	0.04
96-RPS-0010	1.56	2.33	0.33	1.59	0.35	0.19	0.31	0.04	0.21	0.03	0.11	0.01	0.12	0.02	2.96	105.9	0.17	0.37	0.06	0.03	0.07	0.08
96-RPS-0011	0.13	0.25	0.05	0.40	0.14	0.05	0.18	0.02	0.16	0.03	0.10	0.01	0.13	0.02	0.10	91.1	0.12	0.02	0.04	0.03	0.02	N.D.
97RPS-0005	4.88	7.51	0.92	4.13	0.65	0.27	0.42	0.05	0.29	0.05	0.16	0.02	0.16	0.02	1.12	276.5	0.08	0.16	0.05	N.D.	0.04	0.06
97RPS-0006	1.68	2.48	0.35	1.86	0.41	0.29	0.38	0.04	0.24	0.04	0.12	0.02	0.12	0.02	0.92	122.6	0.05	0.10	0.06	N.D.	0.04	0.08
97RPS-0007	1.41	2.13	0.35	1.49	0.35	0.16	0.28	0.04	0.22	0.04	0.12	0.02	0.13	0.02	2.41	89.1	0.08	0.27	0.05	N.D.	0.05	0.33
97RPS-0008	0.27	0.44	0.08	0.63	0.26	0.25	0.29	0.06	0.34	0.08	0.25	0.04	0.30	0.06	0.46	102.5	0.05	0.05	0.07	N.D.	N.D.	N.D.
97RPS-0009	0.19	0.48	0.10	0.66	0.22	0.37	0.25	0.04	0.23	0.05	0.18	0.03	0.27	0.05	0.24	96.4	0.04	0.05	0.05	N.D.	N.D.	N.D.
97RPS-0010	6.90	13.36	1.72	7.95	1.06	0.58	0.57	0.07	0.46	0.08	0.26	0.04	0.26	0.05	0.84	78.4	0.03	0.04	0.06	N.D.	N.D.	N.D.
97RPS-0011	26.26	50.87	6.50	28.54	3.51	0.99	1.26	0.11	0.67	0.09	0.32	0.04	0.27	0.04	0.31	78.0	0.03	0.03	0.04	N.D.	N.D.	0.09
97RPS-0012	8.69	16.57	2.16	9.46	1.16	0.44	0.45	0.05	0.28	0.04	0.16	0.02	0.14	0.02	0.33	72.6	0.03	0.04	0.02	N.D.	N.D.	0.07

Notes: N.D., not detected; NA, not analyzed.

Table 5. CIPW normative mineral calculations, matrix of diamond-bearing lamprophyre dikes.

Sample	96RPS-0012	96RPS-0013	96RPS-0014	97RPS-0002	97RPS-0004	97RPS-0001	97RPS-0003
SiO2	47.30	46.82	48.33	48.98	48.94	50.19	50.84
TiO2	0.69	0.93	0.89	1.06	1.41	1.22	1.20
Al2O3	8.88	10.92	9.97	11.62	10.36	14.73	14.92
Fe2O3	9.57	11.05	10.13	10.85	10.84	11.15	10.96
FeO	6.60	8.15	6.84	6.44	6.81	5.36	5.18
MnO	0.14	0.17	0.16	0.17	0.14	0.22	0.17
MgO	20.00	11.93	13.61	11.39	9.75	6.70	6.68
CaO	6.43	9.00	8.97	9.05	8.33	7.81	8.44
Na2O	0.34	1.71	2.05	1.96	1.46	1.54	0.49
K2O	3.98	3.71	2.83	2.94	4.16	3.75	4.00
H2O +	3.63	1.98	1.95	2.00	1.98	1.93	2.03
H20 -	0.30	0.15	0.18	0.14	0.21	0.10	0.15
P2O5	0.28	0.34	0.34	0.22	0.51	0.36	0.31
LOI	2.91	3.38	2.86	1.65	2.90	1.35	1.32
Total	100.51	99.95	100.15	99.89	98.80	99.02	99.33
CO2	0.14	1.96	1.60	0.64	1.75	0.18	0.14
S			0.03		0.02	0.03	0.11
Q	-	-	-	-	-	4.02	8.00
C	-	-	-	-	-	-	-
OR	22.59	20.95	16.08	16.61	23.96	21.53	22.93
AB	2.76	8.94	16.41	15.82	12.01	12.63	4.01
AN	10.47	10.62	9.23	13.55	9.14	21.50	25.81
NE	-	2.63	0.13	-	-	-	-
LC	-	-	-	-	-	-	-
AC	-	-	-	-	-	-	-
NS	-	-	-	-	-	-	-
DI	14.54	23.78	24.80	21.98	22.06	10.94	10.12
DIWO	7.76	12.57	13.19	11.74	11.77	5.87	5.43
DIEN	6.36	9.70	10.66	9.75	9.70	5.06	4.69
DIFS	0.42	1.50	0.94	0.49	0.59	-	-
HY	10.88	-	-	5.85	11.36	11.19	11.50
HYEN	10.20	-	-	5.57	10.71	11.19	11.50
HYFS	0.68	-	-	0.28	0.65	-	-
OL	23.61	15.38	16.92	8.77	2.48	-	-
OLFO	21.99	13.14	15.41	8.31	2.32	-	-
OLFA	1.62	2.24	1.51	0.46	0.16	-	-
MT	13.32	15.30	14.11	15.03	15.30	14.03	13.34
HM	-	-	-	-	-	1.15	1.42
IL	1.26	1.69	1.62	1.92	2.61	2.25	2.21
AP	0.59	0.71	0.71	0.46	1.08	0.76	0.66
CC	-	-	-	-	-	-	-
Col. Index	63.60	56.15	57.45	53.55	53.81	38.41	37.17
Diff. Index	25.35	32.53	32.61	32.44	35.97	38.18	34.94

Note: 97RPS-0001 and 97RPS-0003 are from late lamprophyre dikes cutting diamond-bearing dikes.

Table 6. CIPW normative mineral calculations, xenoliths in diamond-bearing lamprophyre dikes

Sample	96-RPS-0008	96-RPS-0009	96-RPS-0010	96-RPS-0011	97RPS-0005	97RPS-0006	97RPS-0007	97RPS-0008	97RPS-0009	97RPS-0010	97RPS-0011	97RPS-0012
SiO2	56.79	51.39	55.76	53.59	53.41	55.13	54.76	53.81	54.87	55.34	55.56	55.79
TiO2	0.05	0.04	0.09	0.03	0.03	0.03	0.04	0.04	0.03	0.06	0.05	0.03
Al2O3	2.18	3.05	1.71	1.84	1.17	1.38	2.42	1.87	1.96	2.10	2.29	1.61
Fe2O3	5.72	6.06	5.65	7.75	5.11	5.38	6.66	7.10	6.80	7.50	7.38	6.69
FeO	4.52	4.91	4.19	5.58	3.61	3.81	4.80	5.08	4.84	5.12	4.91	4.53
MnO	0.05	0.12	0.16	0.27	0.18	0.16	0.17	0.23	0.21	0.21	0.21	0.21
MgO	27.61	27.21	21.79	19.17	22.28	22.87	22.55	20.34	20.95	20.43	20.66	20.94
CaO	0.62	2.70	11.86	14.06	12.80	10.81	10.99	13.35	12.97	12.57	12.53	12.15
Na2O			0.08	0.18	0.08	0.07	0.05	0.14	0.14	0.23	0.25	0.20
K2O	0.18	0.03	0.10	0.03	0.05	0.04	0.08	0.04	0.03	0.07	0.04	0.04
H2O +	5.27	5.38	2.82	2.26	2.75	3.04	3.23	2.50	2.58	2.29	2.43	2.32
H2O -	0.09	0.08	0.11	0.10	0.09	0.11	0.10	0.08	0.08	0.08	0.15	0.13
P2O5												
LOI	5.93	8.99	2.72	3.38	5.02	4.05	2.44	2.62	2.42	1.52	1.89	1.81
Total	99.09	99.54	99.89	100.27	100.07	99.86	100.10	99.49	100.33	99.97	100.80	99.41
CO2	1.03	3.98	0.28	1.53	2.93	1.62	0.23	1.01	0.67	0.18	0.25	0.21
S							0.02					
Q	12.00	4.09	7.12	5.63	3.87	6.72	5.48	5.25	5.82	6.82	6.74	7.73
C	0.88	-	-	-	-	-	-	-	-	-	-	-
OR	1.09	0.19	0.58	0.17	0.30	0.24	0.46	0.23	0.17	0.40	0.23	0.23
AB	-	-	0.67	1.48	0.68	0.59	0.41	1.16	1.15	1.88	2.03	1.65
AN	3.15	8.61	3.95	4.02	2.72	3.34	5.98	4.27	4.50	4.33	4.82	3.30
NE	-	-	-	-	-	-	-	-	-	-	-	-
LC	-	-	-	-	-	-	-	-	-	-	-	-
AC	-	-	-	-	-	-	-	-	-	-	-	-
NS	-	-	-	-	-	-	-	-	-	-	-	-
DI	-	4.24	42.31	50.25	48.15	39.44	36.95	47.55	45.50	43.74	43.07	43.57
DIWO	-	2.26	22.58	26.74	25.72	21.07	19.71	25.33	24.26	23.32	22.98	23.25
DIEN	-	1.86	18.65	21.59	21.39	17.52	16.22	20.66	19.88	19.11	18.91	19.18
DIFS	-	0.11	1.08	1.93	1.03	0.86	1.02	1.55	1.37	1.31	1.18	1.15
HY	74.30	73.60	37.12	27.42	36.72	41.79	41.22	31.38	33.21	32.23	32.73	33.97
HYEN	70.64	69.36	35.08	25.17	35.03	39.84	38.77	29.19	31.07	30.17	30.81	32.05
HYFS	3.66	4.24	2.04	2.25	1.69	1.95	2.45	2.19	2.14	2.06	1.92	1.91
OL	-	-	-	-	-	-	-	-	-	-	-	-
OLFO	-	-	-	-	-	-	-	-	-	-	-	-
OLFA	-	-	-	-	-	-	-	-	-	-	-	-
MT	8.49	9.20	8.08	10.96	7.51	7.83	9.42	10.09	9.59	10.49	10.30	9.49
HM	-	-	-	-	-	-	-	-	-	-	-	-
IL	0.10	0.08	0.17	0.06	0.06	0.06	0.07	0.07	0.06	0.11	0.09	0.06
AP	-	-	-	-	-	-	-	-	-	-	-	-
CC	-	-	-	-	-	-	-	-	-	-	-	-
Col. Index	82.88	87.12	87.68	88.70	92.43	89.12	87.66	89.09	88.36	86.58	86.19	87.09
Diff. Index	13.09	4.27	8.37	7.29	4.85	7.55	6.36	6.64	7.14	9.10	9.00	9.61

Table 8. Chromite analysis from "Sandor" diamond discovery site.

Sample chromite	SiO2	TiO2	Nb2O5	Al2O3	Cr2O3	V2O5	MgO	CaO	MnO	FeO*	NiO	ZnO	Total	Fe2O3	FeO	Total
BAG1-1	0.04	0.24	0.00	7.54	51.51	0.29	0.31	0.00	1.68	35.09	0.10	2.62	99.42	6.48	29.26	100.07
BAG1-3	0.01	0.31	0.00	13.59	53.21	0.05	6.69	0.01	0.36	23.76	0.10	0.10	98.19	0.59	23.23	98.25
BAG4-1	0.02	0.00	0.00	21.67	38.73	0.15	1.90	0.02	1.32	33.56	0.11	2.20	99.68	4.69	29.34	100.14
BAG4-2	0.13	0.13	0.00	17.17	39.35	0.13	0.90	0.00	1.53	37.60	0.17	2.41	99.53	8.47	29.98	100.37
BAG4-3	0.10	0.11	0.02	17.58	43.52	0.11	1.13	0.00	1.48	32.34	0.12	2.14	98.65	3.03	29.61	98.96
BAG4-4	0.50	0.15	0.07	12.39	39.63	0.30	0.76	0.01	1.66	40.65	0.15	2.24	98.51	11.81	30.03	99.70
BAG4-5	0.09	0.01	0.00	15.12	48.41	0.16	0.75	0.00	1.63	30.78	0.01	2.53	99.49	1.34	29.58	99.62
BAG4-6	0.06	0.01	0.00	5.93	53.60	0.07	0.36	0.01	1.82	35.09	0.13	2.23	99.30	7.28	28.54	100.03
BAG4-7	0.12	0.35	0.02	4.19	56.49	0.34	0.16	0.00	1.84	33.20	0.00	2.51	99.21	4.46	29.19	99.66
BAG5-1	0.11	0.06	0.00	20.86	40.18	0.23	0.80	0.00	1.41	32.25	0.10	4.15	100.15	3.09	29.47	100.46
BAG5-2	0.04	0.00	0.05	13.44	50.12	0.07	1.91	0.01	1.42	30.73	0.11	1.94	99.82	2.87	28.14	100.11
BAG5-3	0.02	0.00	0.01	13.44	51.05	0.09	3.30	0.00	1.33	30.27	0.03	0.58	100.12	3.05	27.53	100.42
BAG5-4	0.01	0.03	0.01	11.18	53.59	0.15	1.04	0.00	1.54	30.81	0.12	1.46	99.96	1.41	29.55	100.10
BAG5-5	0.25	0.04	0.00	4.49	61.03	0.15	0.43	0.00	1.66	29.23	0.06	2.30	99.64	0.49	28.79	99.68
BAG5-6	0.05	0.17	0.00	6.15	53.98	0.30	0.36	0.02	1.72	34.07	0.00	2.45	99.27	5.58	29.05	99.83
BAG5-7	0.08	0.00	0.01	13.39	49.06	0.19	0.59	0.00	1.56	31.21	0.03	3.59	99.71	2.73	28.76	99.98
BAG5-8	0.27	0.00	0.01	4.68	60.62	0.21	0.42	0.01	1.78	29.22	0.12	2.52	99.85	0.68	28.61	99.92
BAG5-9	0.03	0.00	0.01	13.29	49.01	0.21	0.54	0.00	1.49	31.44	0.05	3.62	99.68	2.93	28.80	99.97
BAG5-10	0.32	0.00	0.00	4.89	60.56	0.16	0.30	0.00	1.78	28.87	0.00	2.88	99.75	0.35	28.55	99.78
BAG5-11	0.08	0.07	0.00	4.43	60.74	0.08	0.32	0.02	1.79	30.01	0.00	2.71	100.23	1.80	28.38	100.41
BAG5-12	0.12	0.17	0.00	4.58	57.17	0.24	0.26	0.01	1.88	32.87	0.00	2.60	99.90	4.48	28.84	100.35
BAG5-13	0.25	0.00	0.00	4.72	60.76	0.24	0.33	0.00	1.69	29.45	0.10	2.55	100.09	0.59	28.92	100.15
BAG5-14	0.07	0.03	0.02	12.15	51.33	0.18	0.53	0.00	1.58	31.15	0.04	2.31	99.39	1.63	29.69	99.55
BAG5-15	0.08	0.16	0.05	5.03	58.71	0.09	0.38	0.01	1.78	31.86	0.09	2.47	100.70	3.33	28.86	101.03
BAG5-16	0.04	0.10	0.00	13.64	49.10	0.06	0.64	0.01	1.45	30.96	0.09	3.47	99.56	2.56	28.66	99.82
BAG5-17	0.04	0.02	0.04	12.83	49.90	0.13	0.51	0.00	1.63	30.88	0.06	3.36	99.40	2.41	28.71	99.65

Table 9. Chromite analysis from the Menzies No. 2 site.

Sample chromite	size (mm)	SiO2	TiO2	Nb2O5	Al2O3	Cr2O3	V2O5	MgO	MnO	FeO*	NiO	ZnO	Total	Fe2O3	FeO	Total
chr-1	0.25 - 0.5	0.08	0.16	0.00	11.38	52.74	0.20	0.69	1.61	29.63	0.04	3.51	100.04	1.20	28.55	100.16
chr-2	0.25 - 0.5	0.40	0.16	0.00	5.96	56.87	0.23	0.48	1.71	31.42	0.05	2.82	100.09	2.67	29.02	100.36
chr-3	0.25 - 0.5	0.30	0.00	0.00	5.64	59.95	0.07	0.46	1.57	29.05	0.02	2.87	99.93	0.57	28.54	99.99
chr-4	0.25 - 0.5	0.31	0.01	0.04	7.24	58.14	0.16	0.60	1.62	29.23	0.02	3.01	100.40	0.56	28.73	100.45
chr-5	0.25 - 0.5	0.27	0.04	0.00	3.03	62.97	0.20	0.38	1.78	29.41	0.00	2.78	100.85	0.88	28.61	100.94
chr-6	0.25 - 0.5	0.09	0.07	0.00	12.52	50.57	0.16	0.71	1.51	30.31	0.00	3.89	99.83	2.23	28.30	100.06
chr-7	0.25 - 0.5	0.28	0.01	0.00	2.97	62.32	0.12	0.37	1.69	29.53	0.01	2.50	99.80	1.14	28.50	99.91
chr-10	0.25 - 0.5	0.25	0.02	0.01	7.19	58.28	0.14	0.59	1.57	29.10	0.03	2.93	100.11	0.52	28.64	100.17
chr-12	0.25 - 0.5	0.08	0.18	0.06	10.88	53.43	0.13	0.64	1.60	30.33	0.00	3.63	100.95	1.76	28.75	101.13
chr-13	0.25 - 0.5	0.11	0.05	0.05	5.58	56.66	0.06	0.36	1.78	33.09	0.00	2.79	100.52	4.96	28.62	101.02
chr-14	0.25 - 0.5	0.16	0.05	0.02	9.07	54.23	0.35	0.53	1.70	30.74	0.00	3.50	100.34	2.23	28.74	100.56
chr-15	0.25 - 0.5	0.33	0.14	0.08	5.58	58.57	0.30	0.39	1.75	30.22	0.02	2.88	100.27	1.19	29.15	100.39
chr-16	0.25 - 0.5	0.29	0.02	0.08	4.63	61.63	0.08	0.41	1.70	28.68	0.00	2.79	100.32	0.07	28.61	100.33
chr-17	0.25 - 0.5	0.28	0.03	0.01	3.01	62.59	0.18	0.31	1.83	29.51	0.00	2.56	100.32	0.91	28.69	100.41
chr-18	0.25 - 0.5	0.03	0.06	0.00	11.31	52.82	0.23	0.70	1.51	29.76	0.02	3.62	100.07	1.48	28.43	100.22
chr-19	0.25 - 0.5	0.31	0.01	0.04	3.98	62.23	0.20	0.46	1.71	28.37	0.01	2.68	100.00	0.00	28.37	100.00
chr-20	0.25 - 0.5	0.09	0.02	0.00	13.86	50.35	0.18	0.77	1.47	30.13	0.06	3.55	100.48	1.38	28.89	100.62
chr-21	0.25 - 0.5	0.10	0.05	0.06	6.88	57.23	0.29	0.46	1.76	30.43	0.01	3.16	100.43	2.00	28.64	100.63
chr-22	0.25 - 0.5	0.05	0.05	0.00	14.98	44.61	0.13	0.81	1.54	34.14	0.11	3.61	100.03	6.11	28.65	100.64
chr-23	0.25 - 0.5	0.30	0.05	0.00	3.15	49.08	0.30	0.27	2.25	40.89	0.04	2.25	98.59	13.80	28.48	99.97
chr-24	0.25 - 0.5	0.28	0.05	0.00	4.80	60.42	0.14	0.52	1.56	29.39	0.00	2.69	99.84	0.88	28.60	99.92
chr-26	0.25 - 0.5	0.26	0.10	0.08	1.66	64.32	0.11	0.31	1.82	28.79	0.00	2.52	99.96	0.42	28.41	100.00
chr-27	0.25 - 0.5	0.07	0.01	0.03	15.38	48.01	0.24	0.84	1.36	31.22	0.09	3.39	100.65	2.02	29.40	100.85
chr-29	0.25 - 0.5	0.40	0.13	0.00	4.32	59.24	0.17	0.48	1.80	30.93	0.01	2.71	100.20	2.45	28.73	100.44
chr-30	0.25 - 0.5	0.05	0.00	0.00	7.27	57.48	0.16	0.50	1.63	30.34	0.02	2.66	100.12	1.78	28.74	100.30
chr-31	0.25 - 0.5	0.59	0.08	0.00	2.94	51.66	0.37	0.17	2.48	37.69	0.03	2.68	98.70	10.25	28.47	99.72
chr-32	0.25 - 0.5	0.25	0.23	0.00	3.33	63.13	0.08	0.40	1.76	28.40	0.04	2.88	100.50	0.04	28.36	100.51
chr-33	0.25 - 0.5	0.14	0.02	0.00	14.72	48.02	0.11	0.69	1.43	30.22	0.02	4.42	99.80	2.29	28.16	100.03
chr-35	0.25 - 0.5	0.15	0.04	0.00	11.71	51.77	0.10	0.74	1.63	30.84	0.03	3.38	100.37	2.50	28.58	100.62
chr-37	0.25 - 0.5	0.12	0.02	0.00	8.51	55.35	0.21	0.42	1.73	30.94	0.00	3.33	100.64	2.44	28.75	100.88
chr-38	0.25 - 0.5	0.25	0.09	0.00	11.17	52.47	0.24	0.70	1.61	29.79	0.00	3.82	100.15	1.43	28.50	100.29
chr-39	0.25 - 0.5	0.06	0.01	0.02	7.26	58.25	0.21	0.39	1.59	29.93	0.00	3.09	100.82	1.13	28.91	100.94
chr-40	0.25 - 0.5	0.07	0.01	0.03	7.84	56.25	0.28	0.54	1.63	30.15	0.01	3.11	99.92	1.78	28.55	100.09

Table 9. continued.

Sample chromite	size (mm)	SiO2	TiO2	Nb2O5	Al2O3	Cr2O3	V2O5	MgO	MnO	FeO*	NiO	ZnO	Total	Fe2O3	FeO	Total
chr-45	0.25 - 0.5	0.14	0.13	0.00	4.77	55.85	0.17	0.30	1.74	33.90	0.03	2.66	99.70	5.75	28.72	100.28
chr-46	0.25 - 0.5	0.14	0.16	0.00	5.01	55.87	0.22	0.35	1.83	33.26	0.03	2.75	99.62	5.21	28.57	100.14
chr-47	0.25 - 0.5	0.22	0.06	0.03	4.47	61.26	0.08	0.49	1.61	29.09	0.02	2.70	100.02	0.72	28.44	100.09
chr-49	0.25 - 0.5	0.26	0.03	0.05	8.80	55.99	0.16	0.52	1.73	29.39	0.00	3.20	100.13	0.73	28.73	100.20
chr-50	0.25 - 0.5	0.06	0.04	0.03	7.86	56.65	0.27	0.54	1.58	30.17	0.00	3.17	100.37	1.63	28.70	100.53
chr-51	0.25 - 0.5	0.29	0.03	0.03	3.84	61.03	0.06	0.34	1.67	29.88	0.00	2.65	99.84	1.48	28.55	99.99
chr-52	0.25 - 0.5	0.03	0.08	0.03	15.69	48.33	0.18	0.81	1.35	29.43	0.00	4.35	100.26	1.06	28.48	100.37
chr-53	0.25 - 0.5	0.28	0.03	0.00	5.04	60.78	0.08	0.46	1.73	29.30	0.02	2.97	100.69	0.96	28.44	100.79
chr-57	0.25 - 0.5	0.29	0.02	0.00	4.83	60.87	0.10	0.45	1.63	29.29	0.03	2.63	100.15	0.67	28.69	100.21
chr-58	0.25 - 0.5	0.09	0.11	0.02	3.54	49.42	0.36	0.18	2.17	40.48	0.02	2.40	98.79	13.23	28.58	100.11
chr-59	0.25 - 0.5	0.29	0.07	0.06	4.47	61.57	0.21	0.38	1.69	29.15	0.02	2.66	100.58	0.09	29.07	100.59
chr-60	0.25 - 0.5	0.27	0.01	0.03	7.68	56.57	0.27	0.56	1.59	30.16	0.00	2.86	100.00	1.22	29.06	100.12
chr-61	0.25 - 0.5	0.26	0.03	0.00	4.92	60.73	0.12	0.47	1.60	29.10	0.02	2.59	99.83	0.51	28.64	99.89
chr-62	0.25 - 0.5	0.04	0.03	0.00	15.41	48.74	0.16	0.79	1.34	29.69	0.02	4.40	100.61	1.37	28.46	100.74
chr-63	0.25 - 0.5	0.15	0.00	0.00	15.32	48.52	0.19	1.04	1.34	29.74	0.04	4.09	100.45	1.46	28.43	100.59
chr-65	0.25 - 0.5	0.06	0.01	0.02	15.43	48.49	0.28	0.88	1.43	29.71	0.04	3.73	100.08	0.98	28.83	100.18
chr-66	0.25 - 0.5	0.05	0.03	0.00	5.56	56.75	0.20	0.40	1.60	32.36	0.02	2.64	99.61	4.13	28.65	100.03
chr-67	0.25 - 0.5	0.05	0.04	0.00	5.58	58.89	0.12	0.55	1.61	30.65	0.04	2.62	100.15	2.46	28.44	100.39
chr-68	0.25 - 0.5	0.08	0.07	0.00	11.49	53.27	0.12	0.72	1.53	30.00	0.02	3.31	100.60	1.37	28.76	100.74
chr-70	0.25 - 0.5	0.06	0.10	0.03	9.47	52.86	0.21	0.57	1.62	31.70	0.00	3.46	100.09	3.56	28.50	100.45
chr-72	0.25 - 0.5	0.23	0.02	0.01	4.92	61.32	0.11	0.49	1.71	28.99	0.01	2.79	100.61	0.52	28.52	100.67
chr-73	0.25 - 0.5	0.05	0.03	0.05	11.04	52.15	0.16	0.54	1.67	30.31	0.02	3.77	99.80	2.35	28.20	100.04
chr-74	0.25 - 0.5	0.13	0.12	0.00	4.53	46.14	0.44	0.21	2.10	42.98	0.01	2.12	98.78	15.28	29.23	100.31
chr-75	0.25 - 0.5	0.02	0.05	0.00	14.21	46.13	0.16	0.75	1.54	33.28	0.01	3.84	99.98	5.32	28.49	100.52
chr-76	0.25 - 0.5	0.18	0.01	0.00	15.07	48.28	0.20	0.61	1.49	29.09	0.00	4.97	99.91	1.21	28.00	100.03
chr-78	0.25 - 0.5	0.05	0.02	0.04	15.43	48.35	0.28	0.88	1.44	29.90	0.05	4.25	100.67	1.49	28.56	100.82
chr-79	0.25 - 0.5	0.32	0.08	0.00	4.13	59.96	0.11	0.41	1.71	30.39	0.02	2.66	99.78	2.06	28.54	99.99
chr-80	0.25 - 0.5	0.10	0.02	0.00	10.77	53.78	0.28	0.64	1.58	29.80	0.00	3.40	100.37	1.10	28.80	100.48
chr-81	0.25 - 0.5	0.05	0.01	0.03	16.16	47.46	0.06	0.97	1.35	29.96	0.08	4.05	100.17	1.87	28.28	100.36
chr-82	0.25 - 0.5	0.32	0.09	0.05	7.43	56.39	0.26	0.57	1.54	30.32	0.00	2.95	99.92	1.39	29.07	100.06
chr-84	0.25 - 0.5	0.07	0.01	0.00	10.65	53.50	0.19	0.58	1.40	29.71	0.00	3.72	99.83	1.44	28.42	99.97
chr-85	0.25 - 0.5	0.16	0.46	0.00	14.79	43.24	0.31	0.67	1.59	34.47	0.00	4.26	99.93	6.02	29.05	100.54
chr-86	0.25 - 0.5	0.31	0.02	0.06	6.13	59.33	0.13	0.53	1.61	28.40	0.02	2.85	99.38	0.00	28.40	99.38

Table 9. continued.

Sample chromite	size (mm)	SiO2	TiO2	Nb2O5	Al2O3	Cr2O3	V2O5	MgO	MnO	FeO*	NiO	ZnO	Total	Fe2O3	FeO	Total
chr-90	0.25 - 0.5	3.24	0.15	0.00	4.07	47.11	0.34	2.32	2.21	37.38	0.00	2.58	99.39	8.82	29.44	100.28
chr-91	0.25 - 0.5	0.04	0.01	0.00	7.32	57.51	0.23	0.50	1.64	29.59	0.03	3.09	99.97	1.34	28.38	100.10
chr-92	0.25 - 0.5	0.11	0.07	0.06	6.20	55.99	0.19	0.40	1.75	31.92	0.00	2.96	99.66	3.81	28.49	100.04
chr-93	0.25 - 0.5	0.07	0.11	0.00	10.88	52.66	0.18	0.63	1.66	30.66	0.00	3.53	100.38	2.34	28.55	100.62
chr-94	0.25 - 0.5	0.06	0.02	0.01	16.12	47.37	0.07	0.84	1.36	30.10	0.02	4.25	100.23	1.93	28.36	100.42
chr-95	0.25 - 0.5	0.26	0.11	0.00	2.90	62.66	0.11	0.35	1.65	29.19	0.00	2.64	99.87	0.76	28.51	99.95
chr-96	0.25 - 0.5	0.28	0.00	0.04	4.49	61.74	0.14	0.49	1.77	29.09	0.03	2.76	100.82	0.55	28.59	100.87
chr-97	0.25 - 0.5	0.15	0.03	0.02	15.41	48.61	0.16	0.92	1.41	29.76	0.04	4.30	100.81	1.43	28.47	100.96
chr-98	0.25 - 0.5	0.11	0.04	0.00	10.84	51.92	0.27	0.54	1.64	30.66	0.00	3.64	99.66	2.39	28.51	99.90
chr-100	0.25 - 0.5	0.08	0.17	0.00	10.79	52.97	0.23	0.67	1.55	30.58	0.00	3.42	100.47	1.92	28.85	100.66
chr-101	0.25 - 0.5	0.13	0.09	0.00	7.77	55.33	0.23	0.53	1.61	31.83	0.05	2.88	100.43	3.16	28.98	100.75
chr-102	0.25 - 0.5	0.08	0.03	0.00	11.08	52.19	0.20	0.60	1.61	30.63	0.03	3.83	100.28	2.57	28.32	100.54
chr-104	0.25 - 0.5	0.07	0.04	0.00	16.49	47.08	0.15	0.94	1.36	29.35	0.05	4.44	99.97	1.36	28.12	100.11
chr-106	0.25 - 0.5	0.19	0.00	0.00	14.47	49.34	0.21	0.75	1.49	29.49	0.01	4.19	100.15	1.11	28.50	100.26
chr-107	0.25 - 0.5	0.29	0.04	0.02	8.84	55.89	0.06	0.61	1.65	29.46	0.03	3.29	100.18	1.14	28.43	100.29
chr-108	0.25 - 0.5	0.31	0.02	0.02	7.46	57.20	0.19	0.58	1.66	29.71	0.04	2.88	100.08	1.02	28.79	100.18
chr-110	0.25 - 0.5	0.31	0.03	0.01	4.53	61.17	0.08	0.43	1.67	29.03	0.03	2.74	100.02	0.58	28.50	100.08
chr-111	0.25 - 0.5	0.31	0.07	0.03	4.31	61.38	0.08	0.37	1.65	28.97	0.02	2.78	99.96	0.44	28.57	100.00
chr-112	0.25 - 0.5	0.23	0.08	0.00	3.94	61.97	0.10	0.45	1.65	29.09	0.02	2.68	100.21	0.67	28.48	100.28
chr-114	0.25 - 0.5	0.10	0.00	0.00	10.36	53.45	0.18	0.66	1.59	30.57	0.01	3.40	100.32	2.28	28.51	100.55
chr-115	0.25 - 0.5	0.06	0.02	0.04	15.47	48.08	0.20	0.85	1.43	30.88	0.05	3.80	100.88	2.08	29.01	101.08
chr-116	0.25 - 0.5	0.09	0.00	0.01	16.62	45.49	0.20	0.90	1.44	31.07	0.02	4.45	100.28	3.02	28.35	100.59
chr-117	0.25 - 0.5	0.06	0.11	0.03	11.10	52.73	0.05	0.60	1.58	30.35	0.05	3.74	100.40	2.28	28.30	100.63
chr-1	0.5 - 1.0	0.19	0.13	0.03	3.39	63.02	0.13	0.34	1.79	28.58	0.00	2.65	100.26	0.05	28.53	100.26
chr-2	0.5 - 1.0	0.28	0.07	0.01	4.38	61.10	0.12	0.53	1.65	29.09	0.00	2.55	99.79	0.65	28.51	99.86
chr-3	0.5 - 1.0	0.07	0.14	0.02	10.56	52.51	0.25	0.65	1.51	30.74	0.01	3.18	99.63	2.09	28.86	99.84
chr-4	0.5 - 1.0	0.07	0.09	0.02	16.16	44.89	0.13	0.94	1.41	32.21	0.01	4.03	99.96	4.10	28.52	100.37
chr-5	0.5 - 1.0	0.27	0.04	0.00	4.36	61.09	0.09	0.51	1.67	28.86	0.03	2.57	99.49	0.62	28.30	99.55
chr-6	0.5 - 1.0	0.09	0.05	0.03	5.37	60.41	0.15	0.53	1.73	29.50	0.00	2.80	100.64	1.17	28.44	100.76
chr-7	0.5 - 1.0	0.27	0.04	0.00	7.43	59.15	0.14	0.55	1.62	28.77	0.00	2.90	100.86	0.00	28.77	100.86
chr-8	0.5 - 1.0	0.04	0.09	0.00	11.46	52.94	0.19	0.59	1.51	29.60	0.03	3.48	99.93	1.03	28.67	100.03
chr-9	0.5 - 1.0	0.08	0.11	0.01	11.09	52.81	0.12	0.74	1.57	30.21	0.04	3.73	100.50	2.17	28.25	100.71

Table 10. Ilmenite analysis from "Sandor" diamond discovery site.

Sample ilmenite	SiO_2	TiO_2	Nb_2O_5	Al_2O_3	Cr_2O_3	V_2O_5	MgO	CaO	MnO	FeO*	NiO	ZnO	Total	Fe_2O_3	FeO	Total	ilmenite	geikielite	hematite
BAG2-2	0.01	49.11	0.05	0.02	0.02	0.00	0.16	0.00	4.33	44.95	0.00	0.03	98.68	6.01	39.54	99.28	92.984	0.662	6.354
BAG4-1	0.01	52.02	0.04	0.05	0.04	0.00	1.57	0.02	0.69	45.02	0.00	0.04	99.52	1.93	43.28	99.71	92.192	5.954	1.854
BAG4-3	0.01	52.12	0.06	0.05	0.03	0.00	1.33	0.02	0.76	45.03	0.00	0.00	99.41	1.38	43.79	99.55	93.606	5.069	1.325
BAG4-4	0.01	52.04	0.05	0.08	0.00	0.00	1.71	0.00	0.69	45.11	0.05	0.00	99.74	2.27	43.07	99.96	91.380	6.454	2.166
BAG4-5	0.01	52.13	0.00	0.06	0.00	0.00	1.61	0.02	0.68	44.70	0.01	0.09	99.31	1.66	43.21	99.47	92.269	6.136	1.595
BAG4-6	0.02	52.67	0.03	0.13	0.10	0.00	1.56	0.00	0.65	44.96	0.01	0.07	100.20	1.18	43.90	100.32	93.003	5.877	1.120
BAG4-7	0.03	52.07	0.05	0.11	0.01	0.00	1.59	0.00	0.70	44.71	0.01	0.03	99.31	1.53	43.33	99.47	92.467	6.062	1.471
BAG5-1	0.00	52.18	0.06	0.08	0.03	0.00	1.77	0.00	0.64	44.63	0.00	0.03	99.41	1.62	43.17	99.57	91.766	6.688	1.546

Table 11. Ilmenite analysis from the Menzies No. 2 site.

Sample ilmenite	size (mm)	SiO2	TiO2	Nb2O5	Al2O3	Cr2O3	V2O5	MgO	MnO	FeO*	NiO	ZnO	Total	Fe2O3	FeO	Total	ilmenite	geikielite	hematite	Totals
chr-8	0.25 - 0.5	0.03	51.17	0.07	0.14	2.71	0.05	9.66	0.33	34.92	0.14	0.04	99.27	7.17	28.47	99.98	58.20	35.21	6.59	100.00
chr-9	0.25 - 0.5	0.03	51.09	0.13	0.16	2.61	0.04	9.82	0.33	34.37	0.10	0.01	98.70	6.80	28.25	99.38	57.88	35.85	6.27	100.00
chr-28	0.25 - 0.5	0.00	51.33	0.14	0.14	2.67	0.00	9.47	0.35	34.66	0.09	0.06	98.92	6.35	28.95	99.55	59.48	34.66	5.86	100.00
chr-34	0.25 - 0.5	0.01	51.07	0.08	0.08	2.67	0.00	9.74	0.38	34.62	0.11	0.01	98.77	7.17	28.17	99.49	57.78	35.61	6.62	100.00
chr-36	0.25 - 0.5	0.00	49.99	0.01	0.00	0.08	0.00	0.12	0.99	48.27	0.00	0.03	99.50	5.06	43.72	100.00	94.63	0.45	4.92	100.00
chr-42	0.25 - 0.5	0.00	50.78	0.14	0.04	2.69	0.00	9.56	0.39	35.04	0.06	0.00	98.71	7.48	28.31	99.46	58.12	34.98	6.91	100.00
chr-44	0.25 - 0.5	0.03	50.89	0.10	0.05	2.60	0.01	9.59	0.36	34.57	0.12	0.06	98.38	6.95	28.31	99.08	58.35	35.20	6.45	100.00
chr-48	0.25 - 0.5	0.00	50.97	0.04	0.00	0.02	0.00	0.33	0.70	47.59	0.01	0.00	99.66	3.35	44.57	99.99	95.50	1.27	3.23	100.00
chr-54	0.25 - 0.5	0.01	50.26	0.01	0.00	0.00	0.00	0.42	0.59	48.18	0.00	0.00	99.47	4.78	43.88	99.95	93.80	1.61	4.59	100.00
chr-55	0.25 - 0.5	0.01	51.26	0.15	0.10	2.70	0.00	9.68	0.36	34.52	0.12	0.06	98.94	6.70	28.49	99.61	58.44	35.37	6.19	100.00
chr-64	0.25 - 0.5	0.00	47.99	0.00	0.00	0.02	0.00	0.16	2.79	47.56	0.05	0.07	98.63	8.46	39.94	99.48	90.70	0.66	8.64	100.00
chr-69	0.25 - 0.5	0.01	50.97	0.09	0.12	2.67	0.06	9.64	0.38	34.51	0.13	0.05	98.63	6.91	28.30	99.32	58.25	35.36	6.40	100.00
chr-99	0.25 - 0.5	0.02	50.40	0.12	0.09	2.75	0.00	9.52	0.39	34.94	0.15	0.03	98.40	7.76	27.95	99.18	57.75	35.04	7.21	100.00
chr-103	0.25 - 0.5	0.01	50.97	0.10	0.08	2.69	0.00	9.61	0.33	34.65	0.14	0.01	98.58	7.02	28.34	99.28	58.28	35.23	6.49	100.00
chr-105	0.25 - 0.5	0.00	51.01	0.12	0.16	2.61	0.00	9.43	0.34	34.49	0.12	0.01	98.28	6.38	28.75	98.92	59.38	34.69	5.93	100.00
chr-109	0.25 - 0.5	0.00	50.84	0.07	0.02	2.71	0.00	9.54	0.34	34.60	0.13	0.01	98.27	6.99	28.31	98.97	58.42	35.09	6.49	100.00
chr-113	0.25 - 0.5	0.02	50.63	0.00	0.00	0.06	0.00	0.02	3.00	45.98	0.02	0.05	99.78	3.96	42.42	100.17	95.89	0.08	4.03	100.00
chr-118	0.25 - 0.5	0.03	50.15	0.00	0.06	0.05	0.00	0.07	3.32	45.92	0.00	0.07	99.67	4.83	41.57	100.16	94.76	0.29	4.95	100.00

Table 12. Summary of sampling results of diamond-bearing lamprophyres (*modified from* Thomas 1998).

Sample site location	Sample number	Weight (kg)	Microdiamonds (<0.5 mm)	Macrodiamonds (0.5-0.8 mm)	Commercial diamonds	Grade (cpht)	Maximum dimension (mm)	Weight (octacarats)	Colour of diamonds
Sandor (SO)	95 HM 101	18.1	5	1	0	19.3	0.65 x 0.62 x 0.40	290444	clear
	LAL-1	31.6	8	2	0	21			white
	LAL-2	36.0	48	6	0	46.2			
	LAL-8	33.3	3	0	0	0.8			
	Sage-96	20.43	0	2	1	NR			
	LAL-200S	169.9	18	3	0	5			
0.13 km N of SO	LAL-3	34.6	1	0	0	0.5	0.22 x 0.22 x 0.20	18368	white, clear
0.73 km S of SO	LAL-103	30.8	3	0	0	2	0.42 x 0.31 x 0.20	47355	white, transparent
4.76 km N of SO	LAL-126	27.3	0	1	0	4	0.68 x 0.42 x 0.25		white, transparent
3.90 km S of SO	Men-107	28.3	6	1	1	14	0.91 x 0.42 x 0.38	261744	white
	Men-207	164.7	81	11	3	27			yellow
4.10 km S of SO	Men-106	27.9	1	1	0	4	0.57 x 0.34 x 0.26	89544	white
3.5 km W of SO	LAL-161	64.7	5	4	0	10	0.71 x 0.42 x 0.30	181437	white
	LAL-163	54.4	1	0	0	0			brown
3.7 km W of SO	LAL-216	50.6	14	1	0	8	0.57 x 0.45 x 0.34	156128	white, transparent
Total			194	33	5				

Note: One of the two diamonds recovered from Sage-96 measured 1.2 by 1.5 by 1.0 mm.

Table 13. Geochemical data on Deep Lake mafic to ultramafic intrusion.

Sample	SiO2	Al2O3	Fe2O3	FeO	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO	CO2	S	H2O+	H2O-	LOI	Total
96-RPS-0015	47.75	8.24	13.59	10.89	19.12	3.71	0.61	1.99	0.45	0.01	0.16	0.33	0.03	5.09	0.17	4.26	99.89
96-RPS-0016	34.49	4.04	16.10	10.00	26.21	2.03	N.D.	0.06	0.41	0.03	0.21	10.90	0.31	5.55	0.29	14.96	98.54
96-RPS-0017	39.64	4.55	14.50	8.63	26.25	1.87	N.D.	0.02	0.31	N.D.	0.15	6.34	0.10	6.27	0.17	11.58	98.86

Sample	Ag	Cd	Be	Co	Cu	Mo	Ni	Sc	V	W	Zn	As	Ba	Cr	Pb	Y	Zr	Ga	Sn
96-RPS-0015	3	N.D.	N.D.	93	224	N.D.	1069	13	104	N.D.	103	N.D.	359	1317	N.D.	13	65	9	N.D.
96-RPS-0016	2	N.D.	N.D.	132	189	N.D.	1339	8	88	N.D.	102	64	34	2127	N.D.	10	53	7	N.D.
96-RPS-0017	2	N.D.	N.D.	110	38	N.D.	1358	10	95	N.D.	102	40	31	1920	N.D.	8	33	7	N.D.

Sample	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Rb	Sr	Nb	Cs	Hf	Ta	Th	U
96-RPS-0015	9.60	19.59	2.37	9.01	1.83	0.45	1.78	0.27	1.49	0.30	0.84	0.12	0.84	0.14	60.36	33.9	3.17	2.36	1.72	0.25	3.27	0.93
96-RPS-0016	5.69	11.31	1.39	5.46	1.16	0.33	1.10	0.16	0.64	0.15	0.45	0.06	0.47	0.07	1.80	71.5	2.64	0.15	1.10	0.15	1.57	0.44
96-RPS-0017	4.16	8.35	1.03	4.16	0.84	0.23	0.82	0.11	0.62	0.11	0.34	0.04	0.33	0.05	0.49	41.2	1.24	0.04	0.72	0.10	1.04	0.29

Note: N.D., not detected.

Table 14. CIPW normative mineral calculations, Deep Lake mafic to ultramafic intrusion.

Sample	96-RPS-0015	96-RPS-0016	96-RPS-0017
SiO2	47.75	34.49	39.64
TiO2	0.45	0.41	0.31
Al2O3	8.24	4.04	4.55
Fe2O3	13.59	16.10	14.50
FeO	10.89	10.00	8.63
MnO	0.16	0.21	0.15
MgO	19.12	26.21	26.25
CaO	3.71	2.03	1.87
Na2O	0.61		
K2O	1.99	0.06	0.02
H2O +	5.09	5.55	6.27
H2O -	0.17	0.29	0.17
P2O5	0.01	0.03	
LOI	4.26	14.96	11.58
Total	99.89	98.54	98.86
CO2	0.33	10.90	6.34
S	0.03	0.31	0.10
Q	-	-	-
C	-	0.37	1.17
OR	11.05	0.38	0.12
AB	4.84	-	-
AN	12.99	10.58	9.68
NE	-	-	-
LC	-	-	-
AC	-	-	-
NS	-	-	-
DI	3.35	-	-
DIWO	1.77	-	-
DIEN	1.35	-	-
DIFS	0.23	-	-
HY	41.94	33.48	52.95
HYEN	35.73	31.21	50.18
HYFS	6.21	2.27	2.77
OL	6.50	29.34	13.54
OLFO	5.46	27.16	12.76
OLFA	1.05	2.18	0.78
MT	18.50	24.95	21.92
HM	-	-	-
IL	0.80	0.83	0.61
AP	0.02	0.07	-
CC	-	-	-
Colour Index	71.10	88.61	89.03
Diff. Index	15.89	0.38	0.12

Metric Conversion Table

Conversion from SI to Imperial			Conversion from Imperial to SI		
SI Unit	*Multiplied by*	*Gives*	*Imperial Unit*	*Multiplied by*	*Gives*
			LENGTH		
1 mm	0.039 37	inches	1 inch	**25.4**	mm
1 cm	0.393 70	inches	1 inch	**2.54**	cm
1 m	3.280 84	feet	1 foot	**0.304 8**	m
1 m	0.049 709	chains	1 chain	20.116 8	m
1 km	0.621 371	miles (statute)	1 mile (statute)	**1.609 344**	km
			AREA		
1 cm^2	0.155 0	square inches	1 square inch	**6.451 6**	cm^2
1 m^2	10.763 9	square feet	1 square foot	**0.092 903 04**	m^2
1 km^2	0.386 10	square miles	1 square mile	2.589 988	km^2
1 ha	2.471 054	acres	1 acre	0.404 685 6	ha
			VOLUME		
1 cm^3	0.061 023	cubic inches	1 cubic inch	**16.387 064**	cm^3
1 m^3	35.314 7	cubic feet	1 cubic foot	0.028 316 85	m^3
1 m^3	1.307 951	cubic yards	1 cubic yard	0.764 554 86	m^3
			CAPACITY		
1 L	1.759 755	pints	1 pint	0.568 261	L
1 L	0.879 877	quarts	1 quart	1.136 522	L
1 L	0.219 969	gallons	1 gallon	**4.546 090**	L
			MASS		
1 g	0.035 273 962	ounces (avdp)	1 ounce (avdp)	28.349 523	g
1 g	0.032 150 747	ounces (troy)	1 ounce (troy)	**31.103 476 8**	g
1 kg	2.204 622 6	pounds (avdp)	1 pound (avdp)	**0.453 592 37**	kg
1 kg	0.001 102 3	tons (short)	1 ton (short)	**907.184 74**	kg
1 t	1.102 311 3	tons (short)	1 ton (short)	**0.907 184 74**	t
1 kg	0.000 984 21	tons (long)	1 ton (long)	**1016.046 908 8**	kg
1 t	0.984 206 5	tons (long)	1 ton (long)	**1.016 046 90**	t
			CONCENTRATION		
1 g/t	0.029 166 6	ounce (troy)/ ton (short)	1 ounce (troy)/ ton (short)	34.285 714 2	g/t
1 g/t	0.583 333 33	pennyweights/ ton (short)	1 pennyweight/ ton (short)	1.714 285 7	g/t

OTHER USEFUL CONVERSION FACTORS

	Multiplied by	
1 ounce (troy) per ton (short)	31.103 477	grams per ton (short)
1 gram per ton (short)	0.032 151	ounces (troy) per ton (short)
1 ounce (troy) per ton (short)	20.0	pennyweights per ton (short)
1 pennyweight per ton (short)	0.05	ounces (troy) per ton (short)

Note: Conversion factors which are in bold type are exact. The conversion factors have been taken from or have been derived from factors given in the Metric Practice Guide for the Canadian Mining and Metallurgical Industries, published by the Mining Association of Canada in co-operation with the Coal Association of Canada.

MAPS NOT FILMED

CARTES NON REPRODUITES